JANIS 75
CHAPTER VI

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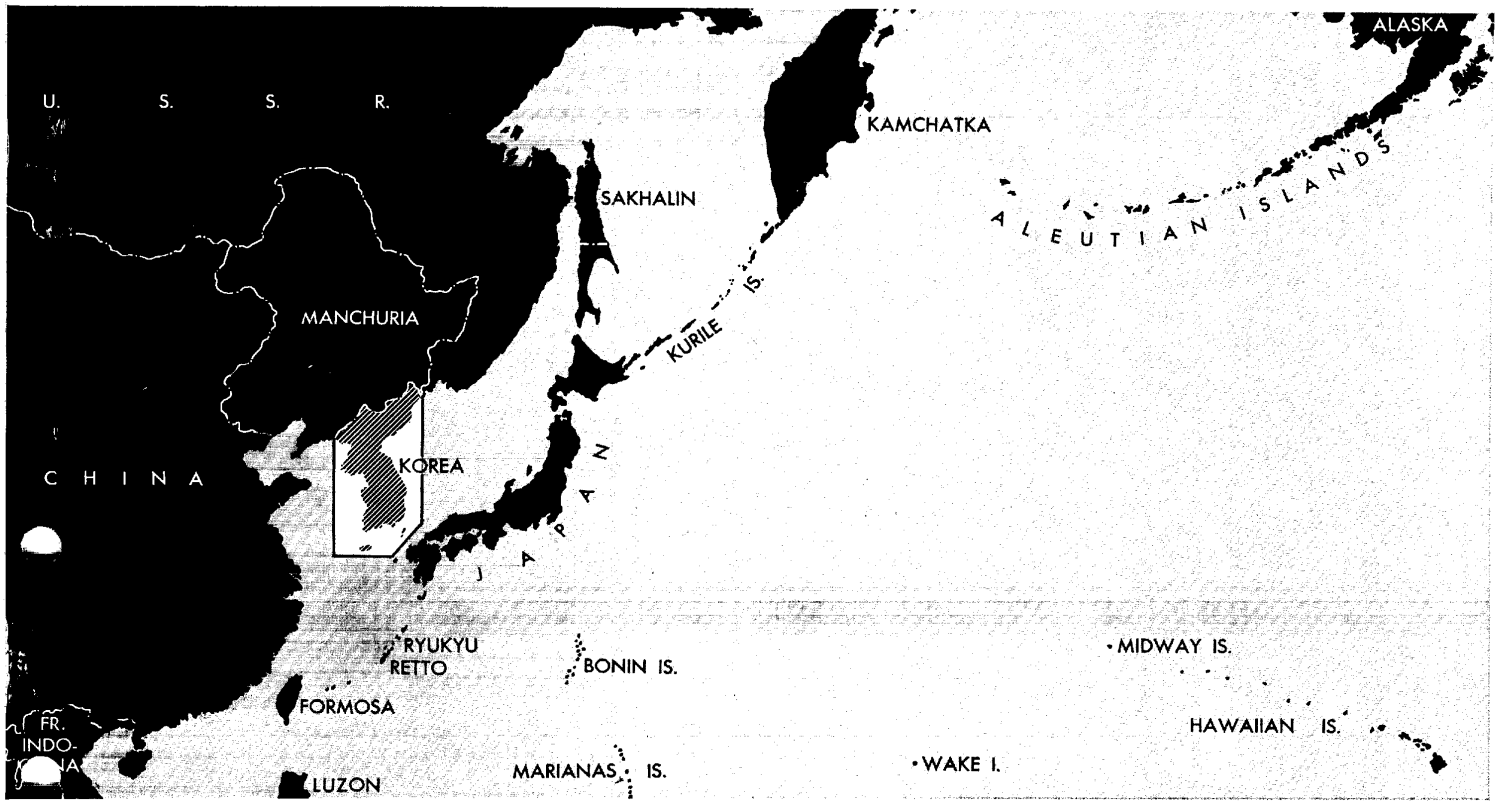

JOINT ARMY-NAVY INTELLIGENCE STUDY

OF

KOREA

(Including TSUSHIMA and QUELPART)

PORT FACILITIES

APRIL, 1945

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PORT FACILITIES

60. *Introduction*

The major ports of Korea are industrial centers and gateways for supplies and raw materials between Japan and Manchuria. Korea has no world trade ports; facilities have been developed either to serve adjacent industries or to transship cargo at railroad terminals. Of the 10 principal ports, Pusan is the most important. Most of the 29 secondary ports are fishing centers only.

In addition to the principal and secondary ports, there are at least 10 other landings around the coast of Korea and at least 11 landings on off-lying islands, divided as follows: one on Ullung-do; four on Tsushima; and six on Cheju-do. Significant details on these landings are listed in TABLE VI - 21.

There are at least 128 anchorages around the coasts of Korea and off-lying islands. These include anchorages adjacent to ports and landings. TABLE VI - 22 lists the significant details on all the anchorages.

FIGURE VI - 93, which appears on an apron at the end of this chapter, locates all the anchorages as well as all ports and landings.

A sea distance of only 120 miles separates the southeastern tip of the Korean peninsula from Japan proper; China is separated from Korea by the narrow Yellow Sea; and the shortest distance between Vladivostok and the Korean boundary is only 78 miles. Korea has only 1 land border; most of this northern border separates the peninsula from Manchuria and only 11 miles of this border touches on territory not held by Japan—the 11 miles in the extreme northeast where the estuary of the Tuman-gang separates Korea from the U.S.S.R.

All principal ports have rail connections. Most of the ports on the northeastern coast of Korea are linked to each other by an east coast railroad line which is tied into the South Manchurian Railroad line near Ch'ongjin. Another branch of the South Manchurian line leads inland from Unggi and Najin. It is possible that the Korean east coast line has been extended southward connecting with additional ports.

The Pusan-Mukden railroad line enters Korea from Manchuria at the secondary river port of Sinuiju - An-tung and continues diagonally across Korea to the terminal port of Pusan on the southeast coast. Pusan, the port closest to Japan, has terminal facilities for the direct handling of freight and passengers from a regular ferry route which links Japan proper with the Pusan-Mukden railroad line. The other terminal of the ferry route is Shimonoseki, a principal port and transportation center on the island of Kyūshū in Japan proper (JANIS 84, Southwest Japan). Branches from the Pusan-Mukden line serve most of the ports on the south and west coasts of Korea. Yosu, on one of these branches, is the terminal of a 9- to 10-hour sea route connecting with Hakota in Japan proper. Roads and railroads linking and serving to clear the ports of Korea are shown on FIGURES VII - 53 and VII - 54, transportation maps, Chapter VII.

Ice does not greatly affect navigation at the coastal ports of Korea. Along the northeast coast of Korea, at the principal ports of Unggi and Najin, and the secondary port of Sosura, ice may interfere with lightering and the use of small craft, and it is reported that an ice-breaker is used at Unggi. At other coastal ports there is no interference from ice. However, the 4 river ports in the northwestern section of Korea—the principal port of Chinnamp'o and the secondary port of Kyomip'o on the Taedong-gang, and the secondary ports of Yongamp'o and Sinuiju - An-tung on the Yalu River—are closed by ice during part of the winter. Drift ice may block the entrance to Chinnamp'o for 3 weeks or more in January and February; at Kyomip'o the river is frozen from the beginning of January to March. Both Yongamp'o and Sinuiju - An-tung are closed by ice from about the first of November to the first of May.

For the purposes of this study, the division of ports into categories of principal and secondary is entirely relative. The following artificial classification device has been used: Ports capable of handling more than 1,000 long tons of cargo per day alongside landing facilities have been considered as principal ports; those capable of handling less than 1,000 long tons per day have been described as secondary ports. In general, the principal ports have anchorage, landing, cargo-handling, and adequate clearance and storage facilities to accommodate ocean-going vessels; secondary ports have facilities for handling only coasters or even smaller craft—generally fishing craft.

In addition to principal and secondary ports, there are some places where shipping is carried on, but because of limited facilities or lack of data, these places have been classified as landings.

The estimated daily port unloading capacity, as used in this study*, is computed by multiplying the number of vessels that can be continuously discharged alongside and in the stream by the total number of tons that can be discharged per ship per day.

In estimating alongside capacity, a liberty ship (500-foot berth in depths of over 24 feet) and a coaster (300-foot to 350-foot berth in depths of 20 feet to 24 feet) were assumed as standard vessels. The discharge rate of a Liberty was considered to be 600 long tons per day, and the discharge rate of a coaster was considered to be 400 long tons per day.

In estimating the discharge capacity of vessels riding at anchor in the stream, the lesser of the following 2 computations was used:

First—the total length of piers, quays, and bulkheads available for use by lighters in depths of over 6 feet was multiplied by 1½ long tons per foot to obtain the capacity of shore facilities for lightering per day.

Second—the number of first-class anchorage berths available at a port was multiplied by 500 long tons to obtain the anchorage discharge capacity per day.

TABLE VI - 1 gives the estimated unloading capacities of the more important Korean ports.

* The method of estimating the daily unloading capacity of ports covered in this study differs from the method used in previous JANIS studies. In previous studies, unloading capacity estimates were based only on the amount of general cargo that could be handled alongside deep-draft berthing facilities, assuming an 8-hour day.

TABLE VI - 1

ESTIMATED UNLOADING CAPACITIES OF KOREAN PORTS

(in terms of long tons per day)

A. Principal Ports.

PORT	ALONGSIDE	IN THE STREAM	TOTAL
Unggi	1,500	5,000	6,500
Najin	10,100	15,000	25,100
Ch'ongjin	4,400	15,000	19,400
Songjin	1,800	5,000	6,800
Hungnam	8,000	7,500	15,500
Wonsan	1,600	10,000	11,600
Pusan	14,800	7,000	21,800
Kunsan	1,200	-------	1,200
Incn'on	3,000	12,500	15,500
Chinnamp'o	1,600	5,000	6,600

B. Secondary Ports.

P'ohang-dong	-------	2,500	2,500
Kamp'o-ri	-------	1,000	1,000
Ulsan-man	-------	1,000	1,000
Masan	-------	7,500	7,500
T'ong-yong	-------	5,000	5,000
Yosu	800	2,500	3,300
Mokp'o	800	2,500	3,300
Kyomip'o	-------	2,000	2,000
Dasado *	1,200	-------	1,200

* Although the estimated unloading capacity alongside landing facilities for Dasado is more than 1,000 long tons per day, it was described as a secondary port because the capacity estimate is based on facilities *"reportedly"* completed.

The principal ports of Unggi and Najin, 10 miles apart on the northeast coast of Korea, are Japanese military ports and are used for the movement of troops and supplies to Manchuria. They have good rail connections with the South Manchuria Railroad. Najin is the larger of the two; it has wharfside berthage for an estimated 47 vessels, including nine 500-foot ships and four 450-foot ships drawing over 30 feet, and it has an extensive anchorage. Unggi can berth four 4,500-ton vessels at its only deep-draft landing facility; its harbor provides a good anchorage for a limited number of vessels.

Ch'ongjin, about 35 miles south of Najin, also shares in the traffic between Japan and Manchuria, but in addition it is one of the leading iron and steel centers in Korea, has a large fishery products and bean oil industry, and is the major outlet for the Musan iron mines, the largest in Korea. It has a commercial harbor which provides wharfside berthage for 10 vessels, eight of them drawing 25 feet and over; it has also 2 industrial harbors for lighters and vessels drawing less than 12 feet. The anchorage area, exposed northward, can probably provide 35 first-class anchorage berths.

Songjin, on the northeast coast, is a major fishing center now being developed as an industrial port. It has a steel plant and a probable magnesium plant. The main wharf can berth three 450-foot vessels; the other landing facilities are for lighters and small craft. The harbor, exposed southward, provides about 4 first-, 5 second-, and 3 third-class anchorage berths.

Hungnam and Wonsan are about 40 miles apart in the head of the large bight which indents the east coast of Korea. Hungnam is at the north end of the bight; Wonsan is at the south end. Both are primarily industrial ports. Hungnam was developed to serve 4 large plants in the chemical industry, and Wonsan is the center of the Korean petroleum refining industry. Two cross-peninsular rail- and road-routes lead inland from near Wonsan.

Hungnam has wharfside berthage for 11 vessels drawing 20 to 30 feet, and one drawing 16 feet, but its small harbor provides only 1 first- and 7 third-class anchorage berths. Wonsan has wharfside berthage for 2 vessels drawing about 24 feet, and for 5 vessels drawing 12 to 16 feet; it has unlimited well-protected anchorage.

On the southeast coast, Pusan's industries include the largest shipbuilding plant in Korea, a diesel engine plant, an iron and steel products fabricating plant, munitions factories, and an oil refinery. About 34 alongside vessel berths, primarily general cargo landing facilities with railroad clearance, are available at Pusan. Nine of these berths are for vessels over 3,000 tons. There are also 2 specialized oil handling facilities and a number of facilities for handling small vessels. Warehouse area totals over 2 million square feet. The harbor area can provide about 14 first-, 20 second-, and 29 third-class anchorage berths.

Although the east coast ports have small tidal ranges, averaging about 1 foot, the ports on the west coast have very large ranges of up to 30 feet which seriously affect navigation.

Kunsan and Changhang-ni are on the Kum-gang estuary in southwestern Korea and share a common harbor. Kunsan is on the south bank of the harbor and Changhang-ni is on the north bank. Kunsan is mainly an export center for wheat and other agricultural products; Changhang-ni has been developed to serve a nonferrous metals refinery. Vessels drawing more than 8 feet can enter the harbor only at high tide; at neap high water least entrance depths are about 20 feet. Three pontoon piers at Kunsan provide about 750 feet of wharfage in 18 to 22 feet of water. At Changhang-ni, 1 pier has a 50-foot face in about 18 feet of water. Only a small amount of cargo can be unloaded in the stream. The harbor provides about 11 third-class anchorage berths.

Inch'on on the Yom-ha estuary at about the middle of the west coast is the port for Kyongsong, the Korean capital, about 25 miles inland, and also serves rapidly expanding industries in its own vicinity. It has a 30-foot tidal range. A tidal basin with lock-gates provides about 4,000 feet of wharfage in depths of over 27 feet and is the only landing facility for deep-draft vessels. Almost all the small craft facilities and most of the inner harbor dry at low water. Unlimited anchorage is available in the channel of the Yom-ha estuary, a section of which forms the outer harbor.

Chinnamp'o is in northwestern Korea on the Taedong-gang estuary about 30 miles from the sea. It is the principal port for the P'yongyang industrial and mining region, and it is the site of a naval coal depot with specialized coal-loading equipment. Four 3,000-ton vessels drawing 20 feet can be berthed at general cargo wharves, and two 6,000-ton colliers can be berthed at the coal depot. The harbor provides about 40 first-class anchorage berths.

Of the 29 secondary ports, only the following have been developed beyond fishing bases and refuge harbors—Ch'aho, Masan, T'ongyong, Yosu, Mokp'o, Yongdangp'o, Kyomip'o, Dasado, Yongamp'o, and Sinuiju - An-tung. With the exception of T'ongyong, all these ports have rail connections.

Ch'aho on the northeast coast has an ore-loading pier with a depth of 27 feet at its face. A modern ore-loading system on the pier is connected by rail directly with the mines about 7 miles inland. Construction of the pier does not permit unloading. The harbor, protected from all but southerly winds, can provide about 1 first-, 1 second-, and 3 third-class anchorage berths.

Masan is in southeastern Korea, 5 miles northwest of the

naval base at Chinhae. Little is known about the port, but some construction work to improve facilities has been started. There are believed to be no landing facilities for ocean-going vessels. In and near the harbor are about 18 first-, 16 second-, and 41 third-class anchorage berths.

T'ongyong, on the southern coast, handles trade for the hinterland and is also a fishing base. There are no deep-draft landing facilities, but about 12,800 feet of quayage have depths of 6 to 10 feet. The harbor, well protected except from east winds, has about 11 first-, 15 second-, and 7 third-class anchorage berths.

Yosu, on the southern coast, has reportedly been used by the Japanese Army in the transportation of troops and supplies from Japan proper to northeastern Asia; use of the port for naval purposes has also been reported. The main pier can berth two 4,000-ton vessels, and is reported to have been enlarged recently to accommodate two 8,000-ton to 10,000-ton vessels. About 1 first-, 11 second-, and 6 third-class anchorage berths are available.

Mokp'o, in southwestern Korea, is an agricultural export center. It is approached through a 50-mile-long entrance channel between numerous banks and islands. Vessels over 6,000 tons cannot readily enter. Two 2,000-ton vessels and many small boats and lighters can berth alongside the landing facilities. About 15 second-class anchorage berths are available and 2 more in strong currents could perhaps be used.

Yongangp'o, on the western coast, is the port for Haeju, a town about 3 miles to the north, and also serves a large rice-growing area. However, it is probably more an industrial than agricultural center. An entrance channel about 21 feet deep leads between drying banks for about 25 miles. About 525 feet of quayage have depths alongside of from 17 to 19 feet. Several third-class anchorage berths are available.

Kyomip'o is in northwestern Korea on the Taedong-gang (river) 16 miles above the principal port of Chinnamp'o and about 46 miles from the open sea. It is the site of the largest iron and steel works in Korea. The few facilities available are used by lighters working cargo for the iron, steel, and coking plants. About 4 first-, 3 second-, and 3 third-class anchorage berths are available over generally poor holding ground. Least entrance depths are between 5 and 6 fathoms.

Dasado, Yongamp'o, and Sinuiju - An-tung are all on the Yalu River or its estuary. Dasado, the only deep-draft port, is approached through a 20-mile-long entrance which has probable least depths of between 3 and 4 fathoms and leads through drying banks. Three reportedly completed wharves can accommodate three 6,000-ton vessels; three other wharves are probably completed. Anchorage is available for one 6,000-ton vessel.

Cargo from Dasado is mainly bound for the growing industrial area in the Yalu River basin, which includes Yongamp'o, Sinuiju, and An-tung. Part of the cargo is cleared by rail and road, but much of it is transshipped into steel barges of 2,000 to 3,000 tons, which draw 12 feet or less and can ascend the river. At Yongamp'o, 15 miles upstream from Dasado, all vessels including the large barges must anchor and work cargo into lighters; there is one pier which can be used by small craft at high tide.

Sinuiju and An-tung are on opposite sides of the river about 14 miles farther upstream; An-tung is on the Manchurian side of the river. Landing and shore facilities have been developed primarily to handle lumber. The waterfront on both banks of the river has been quayed or bulkheaded for a total length of 11,900 feet, and provides berths for small coasters and for the 2,000- to 3,000-ton barges.

Other secondary ports are: Sosura, Odaejin-hang, Yongom-ni (Yonam-ni), Sinch'ang, Sinp'o, Kojo-p'o, Changjon-hang, Tae-po-ri, Chumunjin, Mukhojin-ni, P'ohang-dong, Kuryongp'o-ri, Kamp'o-ri, Pango-ri, Ulsan-man, Chise-p'o, Changsung-p'o, Nungp'o-ri, and Samch'onp'o.

Chinhae, on the southeastern coast near the secondary port of Masan, is the only significant naval base in Korea. Some naval use has been made of Takeshiki on the off-lying island of Tsushima. Both of these places are described in Chapter XIII, Naval Facilities. Chapter XIII also discusses the possible naval uses of the commercial ports and facilities described in this chapter.

TABLE VI - 2 lists the ports for which aerial photography was available in Washington on 22 February 1945. The sortie numbers, dates, scales, and quality of the aerial photographs used in the preparation of this study are given in this table.

TABLE VI - 2

PORTS IN KOREA WITH AERIAL COVERAGE
(22 February 1945)

NAME	LOCATION	SORTIE NUMBER	DATE	SCALE	QUALITY
Unggi	42°20'N, 130°24'E	4MR44—468 BG	21 Dec. '44	1:52,000	Poor
Sosura	42°16'N, 130°36'E	4MR44—468 BG	21 Dec. '44	1:52,000	Very poor
Najin	42°12'N, 130°18'E	4MR44—468 BG	21 Dec. '44	1:52,000	Very poor
Ch'ongjin	41°47'N, 129°50'E	4MR44—468 BG	21 Dec. '44	1:11,500; 1:52,000	Very poor; obliques, no stereo
Songjin	40°40'N, 129°12'E	4MR44—468 BG	21 Dec. '44	1:11,500; 1:52,000	Good
Hungnam	39°50'N, 127°37'E	4MR44—468 BG	21 Dec. '44	1:6,900; 1:11,500; 1:52,000	Excellent
Yongom-ni (Yonam-ni)	40°28'N, 128°54'E	4MR44—468 BG	21 Dec. '44	1:6,900; 1:11,500; 1:52,000	Fair
Sinp'o	40°02'N, 128°12'E	4MR44—468 BG	21 Dec. '44	1:6,900; 1:11,500; 1:52,000	Fair; very poor stereo
Mayang-do	40°00'N, 128°12'E	4MR44—468 BG	21 Dec. '44	1:6,900; 1:11,500; 1:52,000	Fair; very poor stereo
Wonsan	39°10'N, 127°26'E	4MR44—468 BG	21 Dec. '44	1:6,900; 1:11,500; 1:52,000	Good
Pusan	35°06'N, 129°02'E	4MR22—468 BG	17 Nov. '44	1:15,500	Good
T'ongyong	34°51'N, 128°26'E	4MR22—468 BG	17 Nov. '44	1:15,500	Very good
Changsungp'o and Nungp'o	34°52'N, 128°44'E	4MR22—468 BG	17 Nov. '44	1:15,500	Good
Inch'on	37°28'N, 126°38'E	4MR49—468 BG;	25 Dec. '44	1:13,800	Excellent
		5MF17 —468 BG	18 Jan. '45	1:56,500	Excellent
Chinnamp'o	38°44'N, 125°24'E	4MR31—462 BG	13 Dec. '44	1:14,000	Fair
Kyomip'o	38°44'N, 125°38'E	4MR29—462 BG;	10 Dec. '44	1:14,000	Fair
		4MR31—462 BG	13 Dec. '44	1:14,000	Fair
Sinuiju-An-tung	40°06'N, 124°24'E	4MR31—462 BG	13 Dec. '44	1:15,000	Good
Cheju	33°30'N, 126°32'E	4MR 9—468 BG	6 Oct. '44	1:44,000	Fair

In the description of most of the ports, reference is made by a plan number to plans which show, on an AMS 1:250,000 base, the location and extent of landing beaches near the coastal ports. These plans are in the JANIS 75 Plans Pouch. The more important of the landing beaches are described in Chapter IV.

Anchorage berth classifications used in this chapter are defined as follows:

First class—a 500-yard diameter circle with a minimum depth of 35 feet.

Second class—a 400-yard diameter circle with a minimum depth of 25 feet.

Third class—a 300-yard diameter circle with a minimum depth of 15 feet.

Spellings of place names in the text are in agreement with those used in AMS L-551, 1:250,000 series, and with the latest decisions of the Board on Geographical Names. Where possible, alternate names have been included in the text to assist in using U.S.H.O. charts along with the text. Correct spellings are given in the Gazetteer, Chapter XV. Most of the places mentioned in this chapter can be located on the plans included in the JANIS 75 Plans Pouch.

TABLE VI - 3 lists a number of Korean, Japanese, Chinese, and Russian generics and their English equivalents; the former are in the first and third columns, the latter in the second and fourth.

TABLE VI - 3
LIST OF GENERICS AND THEIR ENGLISH EQUIVALENTS

-ak	point, mountain	-lyong	pass
-am	rock	-mal	point
-bong	mountain	-man	bay
*Bukhta	bay	-matsu	point
-chedo	archipelago	-misaki	point
-chi	pond	*Mys	cape, point
-ch'i	pass	-ni	village, town
**Chiang	river	-nyong	pass
Ch'ih	small lake	*Ostrov; O	island
-ch'on	river	-pando	peninsula
-dae	mountain	-p'o	harbor
-dan	point	-pong	mountain
-do	island	*Proliv; Pr	strait
dō	province, village	*Poluostrov	peninsula
-dong	village, town	-rei	pass
-gak	point	*Reka	river
-gan	rock	-rettō	island chain
-gang	river	-ri	village, town
-gap	point	-ryong	pass
-gun	county	-sa	temple
-guntō	archipelago	-saki	point
-hae	sea	-san	mountain
-hang	harbor	-sen	river
-hantō	peninsula	*Shan	mountain
**Ho	river	*Shan-mo	range
-ho	lake	*Sheng	province
-hō	mountain	-shima	island
**Hsien	district	-shō	island
-hyon	pass	-shotō	archipelago
-ji	pond, temple	-so	island
-kai	sea	-su	river
-kaikyō	strait	-sudo	channel
-kaku	point	-sui	river
-kan	point	-suidō	channel
-kang	river	-tan	point
-ko	lake, point	-tan	cape
-kō	harbor, river	-to	island
**Kou	river	-tō	island
**K'ou	river mouth	-tong	village, town
-kun	county	-wan	bay
-kundo	archipelago	-yolto	island chain
***Kutchi	point	-zaki	point
-li	village, town	*Zaliv	gulf, bay
**Ling	mountain, range	-zan	mountain

*Russian.
**Chinese.
***Used on U.S.H.O. charts.

61. *Principal Ports*

A. Unggi (Yūki).

(42°20'N, 130°24'E)

Unggi (Yūki), a town under Japanese military command, is on the northeast coast of Korea near the meeting of the Russian, Manchurian, and Korean borders (PLANS 4 and 47). Together with Najin, 10 miles southwestward, and Ch'ongjin, the port of Unggi shares the traffic between Japan and central Manchuria. The only deep-draft landing facility, a 1,500-foot concrete quay with depths of 24 feet alongside, can berth four 4,500-ton vessels. The estimated total daily unloading capacity for the port is 6,500 long tons, with 1,500 long tons handled at the concrete quay and the rest worked in the stream. Adequate facilities are available for handling lighters in a small craft basin.

The harbor is at the head of a small indentation in the northwest corner of Chosan-man (Zōsan-wan), a larger bay. The bay is well protected from all directions but the southwest. However, since it is open to the southwest it is subject to heavy squalls in summer. The harbor provides good anchorage for a limited number of vessels, but additional anchorage is available in adjacent areas. The small craft basin freezes solid in winter, and shore-fast and skim ice are frequently in the harbor, but it is reported that a local ice-breaker keeps the harbor clear.

(1) *Harbor.*

The harbor is at the head of Unggi-hang, a small indentation in the northwest corner of Chosan-man (Zōsan-wan), a large bay which indents the coast between Songjong-dan (Jōtei-tan, Sonchon Tan) and Opo-dan (Ulo-tan) just south of the Tuman-gang on the Russian frontier (FIGURE VI - 1). Unggi-hang, about 2 miles wide at its entrance, between Pip'a-do (Biwa-tō, Pipa Somu) and Kalchoe-dan (Karuun Tan) extends inland about 2½ miles in a northwestward direction. At its northeastern extreme is the town of Unggi, in its northwestern corner is a narrow shallow strait which leads to a wide, reed-filled fresh-water lagoon called Yongsu-ho (Ryūsui-ko) into which 2 rivers, the Todai and the Unggi, empty.

The bay is well protected from the severe north winds of winter by the mountains which surround it; but since it is open to the southwest it is subject to heavy swells in summer. The harbor, which is defined as that part of Unggi-hang above a line drawn from the southeastern tip of Pip'a-do (Biwa-tō, Pipa Somu) to Kum-dan (Kin Tan), embraces an area of about 2¼ square miles, exclusive of the area in the small craft basin. Depths are ample, shoaling gradually from about 10 fathoms at the harbor entrance to 1½ fathoms at its northern extremity; the 5-fathom curve generally lies within 400 yards offshore.

The port itself consists of 2 sections: a small craft basin fronting the town at the northeast corner of the harbor; and a 1,500-foot concrete quay (Reference ⑩)* capable of handling large vessels across the bay from town (FIGURES VI - 2 and VI - 3). The small craft basin, an area of some 105,875 square yards, is enclosed by 3 breakwaters: the southeast breakwater (Reference ①) about 220 feet in length; a curving detached breakwater (Reference ②) approximately 900 feet in length;

* References are encircled letters and numbers on FIGURE VI - 1).

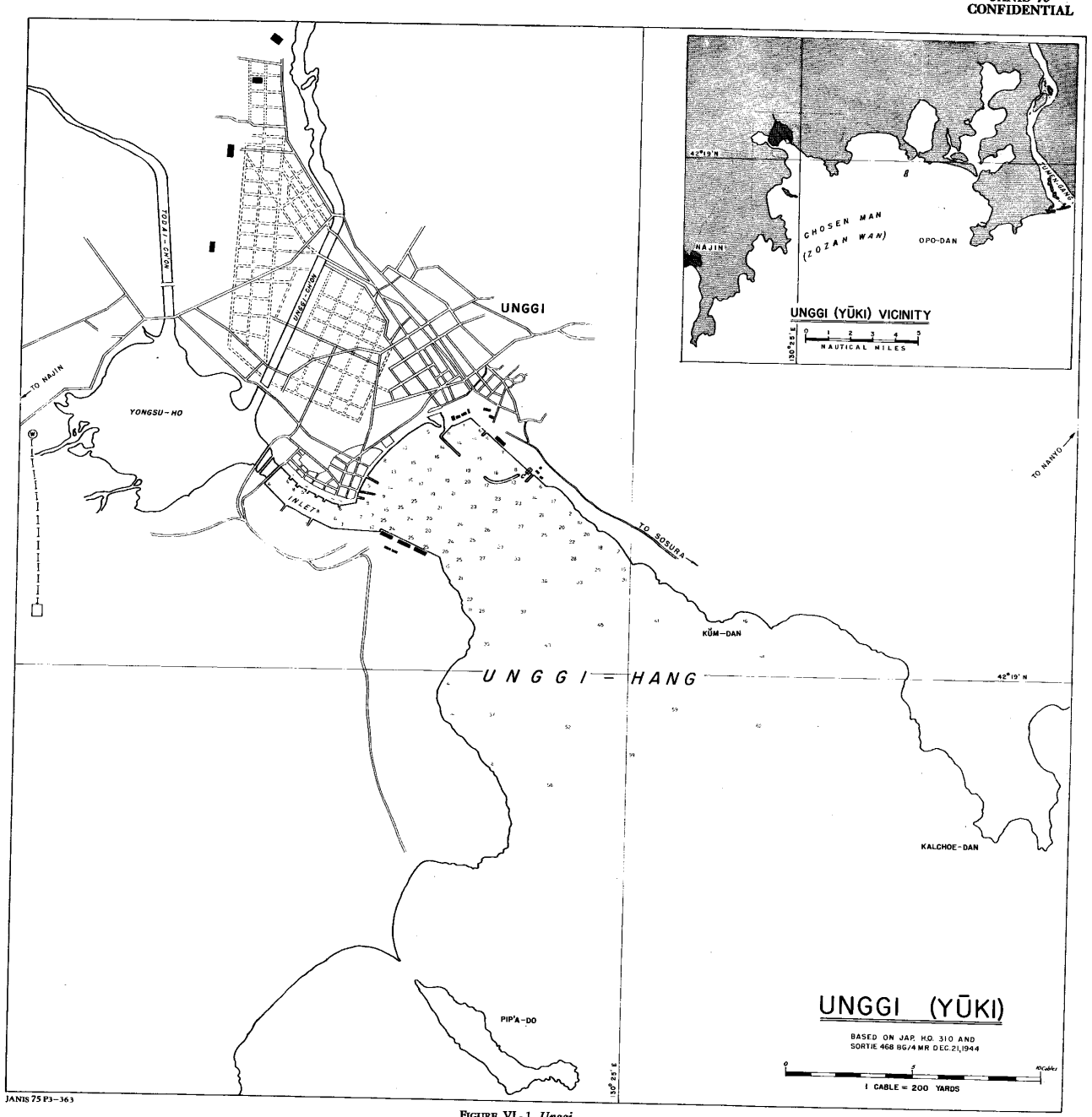

FIGURE VI - 1. *Unggi.*
Port plan showing location of facilities by encircled reference numbers.

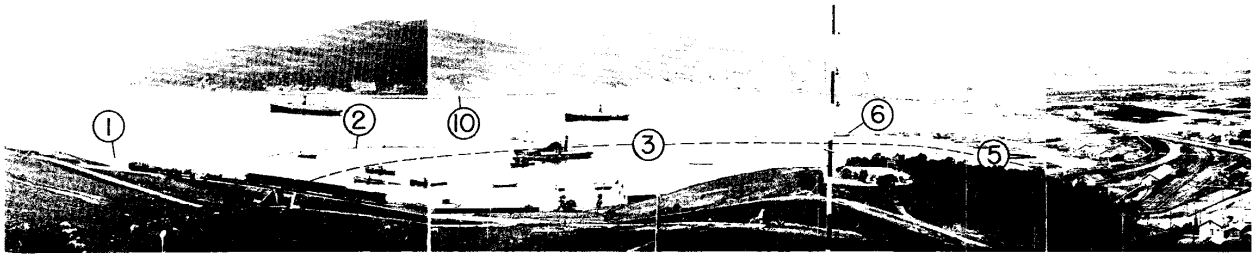

FIGURE VI-2. *Uggla.*
Panorama of harbor, taken from hills behind small craft basin quay (Reference 3), looking southwestward across harbor to southwest quay (Reference 10). About 1954. Southwest quay (Reference 10) has since been extended to the right and 3 large warehouses have been built on it.

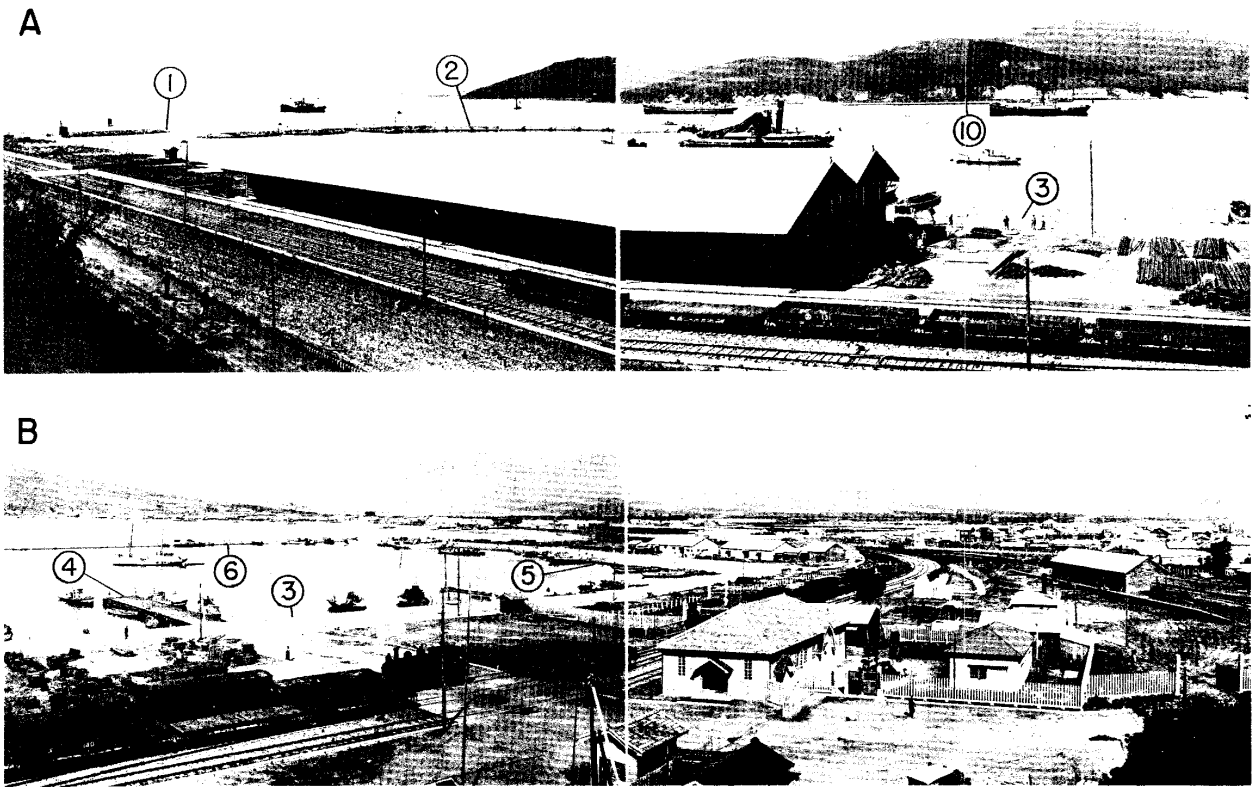

FIGURE VI-3. *Uggla.*
Panorama of harbor, taken from rear of small craft basin quay (Reference 3), looking south southeastward to northward, showing details of small craft basin. About 1954. Southwest quay (Reference 10), across the harbor, has since been extended to the right and 3 large warehouses have been built on it.

and a right-angled breakwater (Reference ⑥) about 825 feet long. The small craft basin is shallow, with depths of 6 to 15 feet, and is used chiefly by coastal vessels and lighters.

Just north of the long southwest quay (Reference ⑩) is the shallow inlet connecting Unggi-hang with the fresh-water lagoon Yongsu-ho (Ryūsui-ko). Depths in the inlet and lagoon range from 2½ to 6 feet. Two small canalized streams flow into the inlet from its southwest bank.

(*a*) *Entrance channel.* The entire area of Unggi-hang is free from dangers beyond 300 yards offshore, except at its extreme head; there are depths of 60 feet at the harbor entrance, and of 25 feet within 500 yards of the head of the bay, and within 400 yards of its eastern and western shores.

(*b*) *Anchorage.* Unggi-hang affords good anchorage to a limited number of large vessels in 15 to 60 feet of water. It is well protected from all but southeast winds, and the holding ground is good. Vessels may anchor anywhere in the roadstead, although a position just off the entrance to the small craft basin, southwest of town, is reported to be best. Small craft may anchor within the basin. There is also fairly good anchorage available in some of the neighboring bays which indent the shores of Chosan-man (Zōsan-wan). A summary description of anchorages in Unggi-hang and adjacent areas follows:

Unggi-hang: 11 first-, 4 second-, and 8 third-class anchorages within the harbor limit line.

Kaidae-man (Gaitai-wan, Mete Wan): 6 first-, 3 second-, and 2 third-class anchorages. Safe only during winter months.

Ch'angjin-man: 2 first-, 3 second-, and 5 third-class anchorages. Safe only during winter months.

Taejin-man (Daishin-wan): 12 first-, 7 second-, and 7 third-class anchorages. Good holding ground. Heavy swell during summer southeast winds.

East Bay: 6 second-class and 5 third-class anchorages less exposed to southeast winds than Kunchin-man.

Sosura: Dicussed under Topic 62, A, (1).

(*c*) *Significant hydrographic features.* Tides and currents are slight in Unggi-hang. The mean high water interval is 3 hours and 3 minutes, the spring rise is 1 foot, the neap rise is ¾ foot, and the mean level above datum is ¾ foot. Tidal currents are negligible.

(*d*) *Local weather.* Temperature ranges, while considerable, are not extreme; July, August, and September are the warmest months, with an average temperature of 66° F.; the period extending from December through March is the coldest, with an average temperature of 21° F. The rainy season lasts from late June until early August, and there are approximately 16 rainy days in each month of this period. Snowfall is light, rarely exceeding 10 or 11 inches; greatest snowfall generally occurs in December.

Winds are a constant hazard in Unggi-hang; strong continental cyclones are common in winter, but the port is well protected from the north and they are not to be feared as much as the occasional southeast gales of summer which bring in seas heavy enough to interrupt offshore loading and unloading operations. Fog is prevalent from May through July, and generally occurs with south winds; although fog usually lasts only a few hours, it sometimes persists for 3 or 4 days. There is an average of 10 foggy days in each month of the foggy season. Ice is more of a problem in Unggi-hang than in Najin or Ch'ongjin; the small craft basin freezes solid in winter, and there is frequently shore-fast and skim ice in the outer harbor. However, it is reported that the local ice-breaker has no trouble in keeping the harbor as a whole clear.

(*2*) ***Landing facilities.***

Landing facilities at Unggi are limited; only the southwest quay (Reference ⑩) can accommodate ships of over 500 tons (FIGURE VI - 4). The small craft basin is able to berth nothing larger than 500- or 600-ton coastal vessels and lighters. Since only a limited number of ships can be taken care of simultaneously at the southwest quay (Reference ⑩), other large vessels must anchor in the stream and depend upon lighters for the handling of cargo. However, the 2,634 feet of fairly well-equipped quayage in the small craft basin adds to the capacity of the port.

The southwest quay (Reference ⑩), completed after 1933, can accommodate four 4,500-ton or possibly three 5,000-ton vessels; however, if the report that the Choyo Maru (9,000 tons) and the Yahiko Maru (9,100 tons) berthed here before 1940 is true, the berthing capacity of the quay is considerably greater.

Southwest Quay (Reference ⑩); details follow:

Location:	Across bay from town.
Purpose:	General commerce.
Construction:	Concrete.
Length:	1,500'.
Depth along side:	24'.
Berthage:	Four 4,500-ton vessels alongside.
Storage facilities:	3 large warehouses about 250' by 50', and 2 smaller ones just behind.
Cranage:	One 10-ton crane.
RR and roads:	2 sets of RR spurs serve quay: one 3-track spur behind large warehouses, one double-track spur behind small. Motor road from town runs down onto quay from hill behind.
Unloading capacity:	1,500 long tons per day.
Remarks:	Berthing capacity may be greater than indicated above: two 9,000-ton vessels are reported to have berthed alongside the quay before 1940. Lighted.

The small craft basin has 2 quays: Reference ⑤ runs 780 feet in an east - west direction along the head of the bay; and Reference ③ extends 1,854 feet northwest - southeast along the eastern shore of the bay (FIGURES VI - 3 and VI - 5). Depths alongside are about 6 feet; the quays are used principally by fishing boats and harbor craft, but coastal vessels berth at the inner section of the breakwater (Reference ⑥) just off the western end of Reference ⑤ in 10 feet of water.

Reference ⑤ has a sloping apron to facilitate loading and unloading of lighters. The customs jetty (Reference ④) extends from Reference ③. The customs jetty (Reference ④) is approximately 126 feet long and 18 feet wide, with depths of 6 feet alongside. A second jetty, approximately 100 feet long and 13 feet wide has been reported, but it is not shown on the latest charts and there is no aerial coverage for this portion of the harbor.

Northeast Quay (References ③ and ⑤); details follow:

Location:	Fronts town in NE corner of bay.	
Purpose:	General commerce.	
Construction:	Stone rubble base, concrete apron.	
	Reference ⑤	Reference ③
Length:	780'	1,854'
Depth alongside:	7½' to 9'	6' to 15'
Storage:	2 or 3 warehouses on N side of Reference ⑤, not directly on RR. Another warehouse at end of 3-track RR spur just inland on NE corner of harbor. Small customs compound on Reference ③. 1 large warehouse about 250' by 50' just below customs pier (Reference ④).	

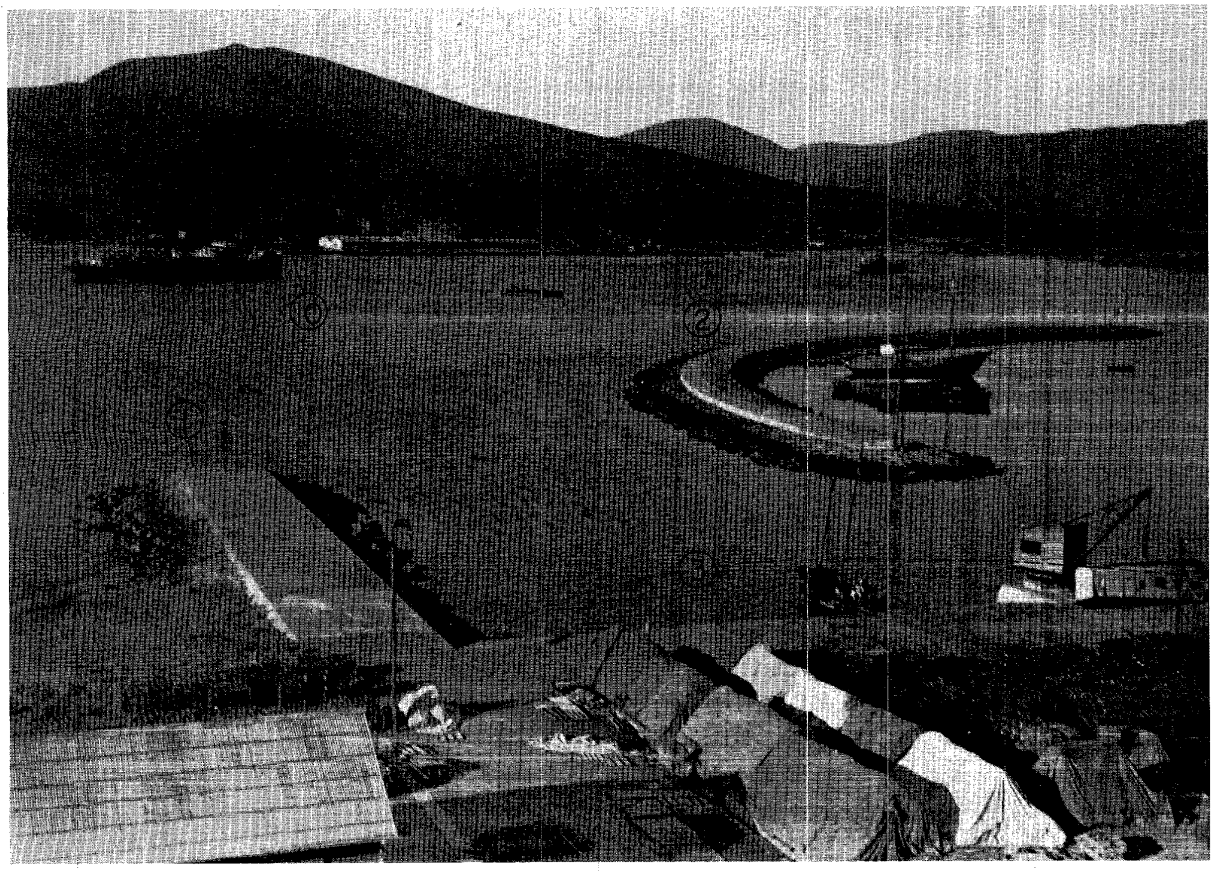

FIGURE VI - 4. *Unggi.*
Southeast end of small craft basin, looking southwestward across harbor to southwest quay (Reference ⑩) under construction. Note new large warehouse in front of one of 2 smaller ones; 2 more large warehouses have been added.

Cranage:	One 10-ton stationary hand crane situated at S end of Reference ③, and one 20-ton traveling steam crane.
RR:	RR spur across Reference ⑤ splits into 2 three-track spurs, one ending at warehouse inland of NE corner of harbor, the other running the length of E quay and passing just behind big warehouse.
Remarks:	Used almost entirely by lighters and small craft, but small coasters frequently berth at W end of Reference ⑤.

Three piers (References ⑦⑧⑨) and 2 small landing stages on the northwest shore of the harbor, just above the mouth of the inlet to Yongsu-ho (Ryūsui-ko) front the new extension of the town. The northernmost of the piers (Reference ⑦) is approximately 180 feet long, with a loading platform 15 feet square at its seaward extremity; the second and oldest of the 3 piers (Reference ⑧) is about 385 feet long, 15 feet wide, and of stone construction with sloping sides; the third and smallest pier (Reference ⑨) is 100 feet long and 15 feet wide. Two small landing stages, about 40 feet square, are between the 2 larger piers. Depths in this area range from 5 to 9 feet. A number of buildings are inland of these piers, but it cannot be determined whether they are warehouses. There are plans for deepening the inlet to Yongsu-ho (Ryūsui-ko) and quaying both shores, but so far the only progress has been to bulkhead the northeast and southwest shorelines and to build a number of small landing stages. These landings are about 25 feet square, with depths of 1½ to 3 feet alongside.

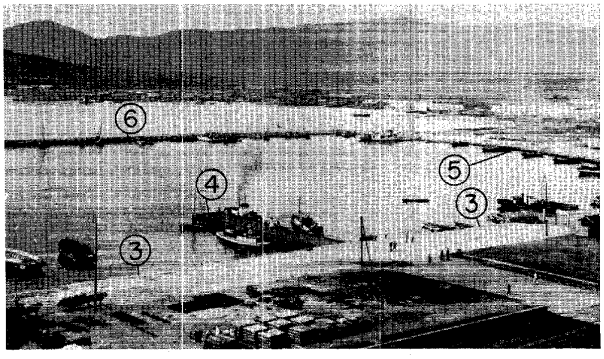

FIGURE VI - 5. *Unggi.*
Northern part of small craft basin, looking westward. About 1934.

Lighters are believed numerous. In 1931 there were 80 lighters, with a total tonnage of about 3,000 tons. Other harbor craft in 1930 included: one 25-ton steam launch which performed the duties of a tug when necessary; a water barge equipped with hand pumps; a coaling craft, six 5- to 19-ton motor boats; and miscellaneous shore boats. An ice breaker is also reported.

(3) ***Storage facilities.***

There are 4 good-sized warehouses at Unggi, each with dimensions of about 250 feet by 50 feet, for a total ground area of 37,500 square feet. Three of these warehouses stand on the southwest quay (Reference ⑩), and the other is on Reference ③ just south of the customs jetty (Reference ④). In addition there are a number of smaller warehouses, 2 on the southwest quay (Reference ⑩), one inland of the northeast corner of the small craft basin, and a small group at Reference ⑤. Most of them are approximately 70 feet by 30 feet, so that a very approximate estimate of warehousing facilities at Unggi would yield a total of about 45,000 square feet. Road and rail clearance for all these warehouses is good.

(4) ***Capacity and clearance.***

(*a*) *Actual annual traffic.* In 1936 Unggi was visited by 1,549 steamers and 88 sailing vessels with a total tonnage of 812,457 and 2,824 tons, respectively.

(*b*) *Estimated unloading capacity.* If the adjoining anchorages of Ch'angjin-man and Taejin-man (Daishin-wan) are excluded from consideration, the estimated total unloading capacity of the port is only 6,500 long tons per day, of which 1,500 tons are unloaded alongside the southwest quay (Reference ⑩), and 5,000 tons are worked in the stream. If these 2 adjoining anchorages are included, however, the total unloading capacity becomes 11,500 long tons per day, of which 1,500 tons are unloaded alongside and 10,500 tons are worked in the stream.

(*c*) *Facilities for clearing port.* Unggi is on the Tumen line, the single-track extension of the South Manchurian Railway which links the ports of Najin and Unggi with the main line at Namyang-dong (Nanyō-dō). The macadamized coastal highway which runs northward from Wonsan connects Ch'ongjin, Najin, and Unggi, and provides easy access to Ching-hsing and the road and railroad systems of the Tuman-gang valley. Other road connections are west to Haengyong, and east to Sosura, which lies across Chosan-man (Zosan-wan) from Unggi, and thence up the Tuman-gang Valley.

Just above Yongsu-ho (Ryūsui-ko), west of town, the railroad splits into 2 branches; the main line runs northward to Unggi station, about 1½ miles northwest of the main part of town, and then crosses the Unggi-ch'on (river) and heads southward along the eastern shore of Unggi-hang, passing eastward of the town itself; the southern line heads southeast directly toward the port and becomes the harbor belt line, sending 1 branch behind Reference ⑤ and onto Reference ③, and another branch down to the southwest quay (Reference ⑩). Reference ③ is served by 2 spurs, each of 3 tracks: the first 3-track spur runs the length of the quay, and the second runs to a warehouse just inland of the northwestern end of the quay. Two sets of spurs serve the southwest quay (Reference ⑩); one 3-track spur running behind large warehouses, and 1 double-track spur behind small warehouse.

Roads connecting with the main coastal highway run along both eastern and northern shores of the harbor, and across the inlet down to the southwest quay (Reference ⑩).

The railroads and roads serving the harbor must pass over bridges crossing Todai and Unggi rivers, 2 streams which run through the town to the westward of the harbor and which empty into the lagoon, Yongsu-ho. The railroads and roads which connect with the southwest quay (Reference ⑩) must pass over bridges crossing the inlet connecting the harbor with Yongsu-ho. Three bridges cross this inlet; aerial coverage shows that the northernmost of the 3 bridges, the old highway bridge, is probably being dismantled and that a new bridge has been constructed northward of the railroad bridge.

(5) ***Supplies.***

(*a*) *Water.* A water barge equipped with hand pumps served ships in the harbor at a rate of 90 tons in 10 hours. A reservoir has been constructed in the hills across the bay west of town, and water is piped to a storage tank along the railroad tracks, and thence into the city. Water from the Tuman-gang may also have been added to the city's supply. All Korean water in this area must be considered unsafe for drinking before being treated.

(*b*) *Oil.* Three petroleum godowns, size and location unknown, were reported in 1931.

(*c*) *Coal.* There is a good-sized coal deposit near the village of Ch'onghak-tong (Seigakudo), about 12 miles northeast of Unggi; in 1931 there were facilities for storing 3,000 tons on Reference ③. There is direct rail connection with Ch'onghak-tong. Small vessels can coal alongside the quay, while larger vessels must use the harbor coaling hulk.

(*d*) *Electricity.* A small electric power plant, generating about 400 horsepower is north of the town on the Unggi-ch'on (river). A steam plant at Aoji-dong, with an installed capacity of 5,000 kilowatts in 1935, supplies electricity to Unggi.

(6) ***Repair facilities.***

A small shipyard which has been turning out wooden cutters of 70 to 80 feet in length, and which could be expanded to produce larger wooden vessels, is reported on the southwestern side of the harbor, possibly on the southwestern shore of the inlet to Yongsu-ho. Motor boat repair works and small foundries, location unknown, are also reported.

B. Najin (Rashin).

(42°13′N, 130°18′E)

Najin (Rashin), on the northwest coast of Korea between Unggi (Yūki) and Ch'ongjin (Seishin), is about 120 miles southwestward of Vladivostok (PLANS 4 and 37). A fishing village prior to 1933 when the Japanese started a major port development program, Najin is now a military port for the movement of troops and supplies to central Manchuria. The Najin-Hsinking (Manchuria) Rail Line, operated by the Japanese Army since 1938, has direct connection with the port facilities and is regarded as the main artery of Japanese military and economic supply between the home islands and Manchuria.

After considering Unggi, Najin, and Ch'ongjin for the site of a key military port, the Japanese government started harbor construction at Najin in April, 1933. The original construction program, divided into 3 parts, called for completion of sufficient facilities to handle 3 million tons of cargo annually by 1938; 6 million tons by 1943; and a total of 9 million tons by 1948. Some installations were completed by 1936 and work has continued since that date, but it is doubtful if the full program has been maintained. The harbor handled almost 900,000 tons of cargo in 1937—fifth largest tonnage in Korea for that year.

Available reports vary greatly as to how much of the original

landing facility construction program has been completed, but 1943 Japanese charts, partially supported by poor quality aerial coverage, indicate the existence of 3 piers, 1 large quay, and 4 wharves. These facilities can berth an estimated 47 vessels, including nine 500-foot ships and four 450-foot ships drawing over 30 feet. The 3 main piers have warehouses; railroads service all the important landing facilities; but little information is available on mechanical handling facilities.

The estimated daily unloading capacity is 25,100 long tons, with 10,100 tons discharged alongside deep-draft landing facilities and 15,000 long tons worked in the stream by 30 Liberty ships.

The deep natural harbor at the head of Najin-man is relatively well protected. Extensive anchorage is available in the harbor and adjacent bays. The harbor is not ice-bound, but floating ice and some freezing may be encountered in December and January.

Both the town and harbor are under military control. Naval installations also have been reported (Chapter XIII).

(1) Harbor.

Najin's relatively well protected, deep natural harbor is at the head of Najin-man (FIGURES VI - 6 and VI - 7). The islands of Taech'o-do and Shoch'o-do form a natural breakwater on the south and divide the approaches into the southwestern and southeastern entrances. A plan to build a breakwater between Shoch'o-do and the mainland, at a point just below the village of Najin-dong, has been reported, but it is not believed that the project has been carried out. The harbor area comprises approximately 13 square miles.

(a) Entrance channels. Before 1942 there were 2 entrance channels to the harbor: the southeastern channel lying west of Taech'o-do, with a least depth of 60 feet; and the southeastern channel between the northern end of Taech'o-do and the southern end of Sech'o-do. The latter channel was available only to small craft with local knowledge. *Since* 1942, *underwater obstacles have been set up in an area northeast of Taech'o-do, rendering this channel useless.*

(b) Anchorages. The available anchorage berths in the harbor and in adjacent bays can provide about 70 first-, 21 second-, and 41 third-class berths. The location of these berths follows:

*Najin-man.** Forty-one first-, 18 second-, and 23 third-class anchorages are available within the harbor-limit line. Although sheltered on 3 sides, holding ground is very poor, and vessels are liable to drag considerably during strong winds. A heavy swell also is reported to run during and after any strong wind. At any sign of bad weather, vessels should be securely moored with all available moorings, good springs being essential.

Southward of harbor limit. The area between the harbor-limit line and a line about a mile southward provides 22 first-, 3 second-, and 4 third-class anchorage berths—all subject to the same conditions noted for the berths within the harbor limits.

* During the Siberian Expedition, 1918, 47 Japanese war vessels anchored here for 3 months.

Yujin-p'o. Seven first- and 11 third-class anchorage berths; fair holding ground; temporary anchorage.

Pangjin-man. Three third-class anchorage berths, well protected; fine sand bottom; temporary anchorage.

The Japanese Pilot indicates mooring buoys capable of accommodating 10,000-ton vessels at Najin-hang (harbor) but does not give a statement of the number.

(c) Significant hydrographic features. Tidal currents within Najin-man are not strong. The harbor surface is reported to be almost glass-like on calm days; however, a heavy swell runs into the harbor during and after strong winds. The mean high water interval is 2 hours and 54 minutes. Both spring and neap tides rise about 7 inches.

(d) Local weather. Southeasterly winds are prevalent from May to September, and northwesterly winds during other times of the year. The rainy season is from June to August inclusive, during which considerable delays in unloading may occur. Snowfall, usually followed by gales, may occur from October to February.

It is believed that the harbor is not actually ice-bound although it does freeze over (8 inches thick in January, 1933), and the islands at the bay entrance considerably hinder the seaward progress of broken ice which reforms into floes. It may be said that Najin is usually half-frozen about the middle of December and remains covered with floating ice during the whole of January.

The harbor is sometimes fog-bound, with dense fogs likely to occur during the spring and summer.

(2) Landing facilities.

Development of significant landing facilities at Najin was started in 1933. Enough of the program was completed by late 1935 to permit loading and unloading operations. The original plan, designed to handle 9 million tons of cargo annually and scheduled for completion in 1948, included the construction of 7 or 8 major piers as well as extensive wharfage and quayage paralleling the shoreline.

Available reports vary greatly as to how much of the original landing facility construction program has been completed, but 1943 Japanese charts, partially supported by poor quality aerial coverage, indicate the existence of only 3 piers, 1 large quay, and 4 wharves—two of these wharves are the bulkheads between the 3 piers (FIGURES VI - 8 and VI - 9). According to the plans, an additional pier will be constructed northeastward of Pier No. 1 (Reference ⑥)* and 4 additional piers will be built southwestward of Pier No. 3 (Reference ②). These additional piers are scheduled to be approximately the same size as the three known to be in operation.

It is estimated that a total of 47 vessels can be berthed at Najin's landing facilities, including nine 500-foot ships and four 450-foot ships drawing over 30 feet. TABLE VI - 4 lists the distribution of vessel berths at Najin.

* References are encircled numbers on FIGURE VI - 7.

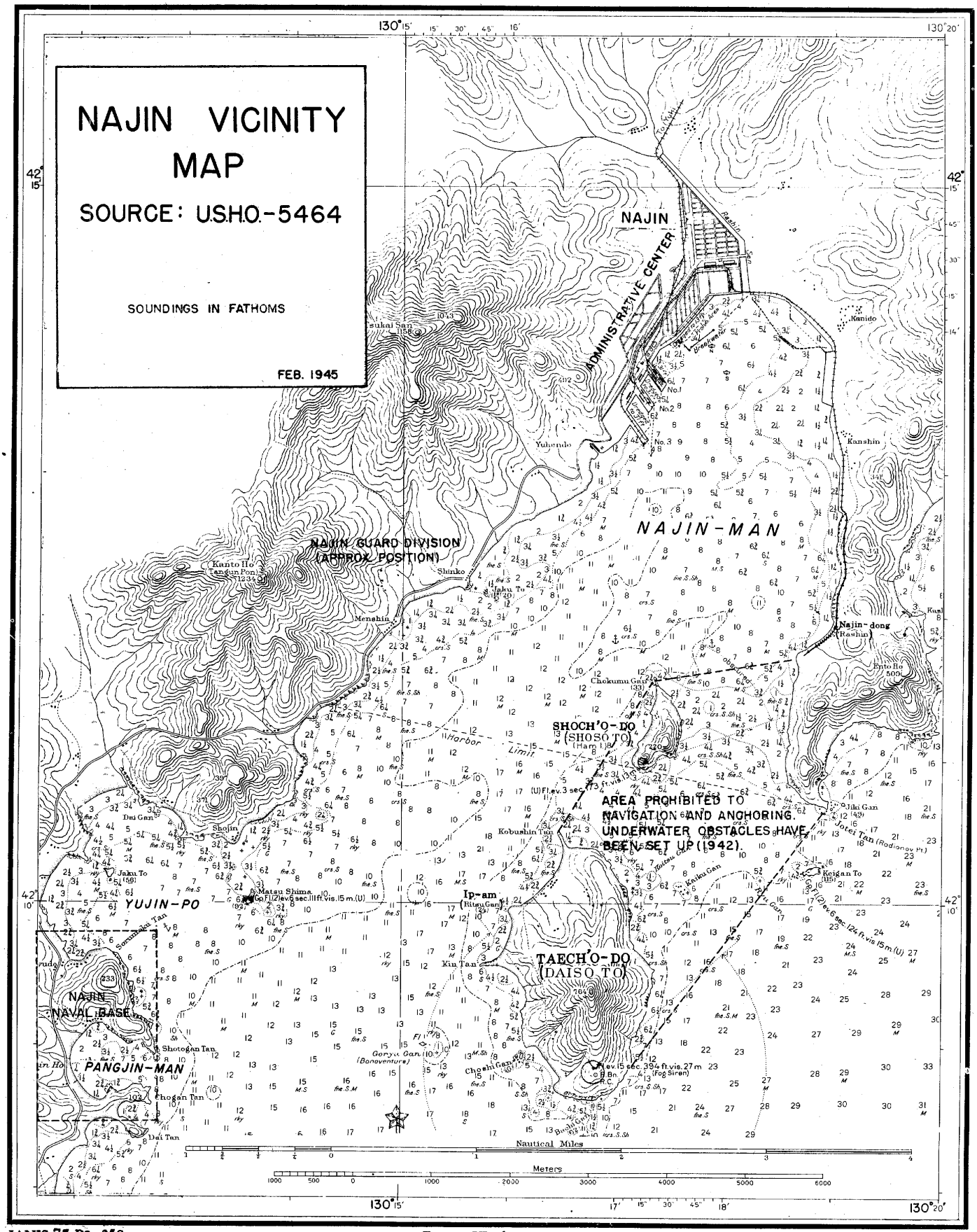

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FIGURE VI-6. *Najin.*
Chart of harbor and approaches.

TABLE VI - 4
DISTRIBUTION OF VESSEL BERTHS AT NAJIN

TOTAL BERTHS	VESSEL LENGTHS (FT.)	ALLOWABLE DRAFTS (FT.)	REFERENCES ON FIGURE VI - 7
4	500	31	⑥
2	500	31	④
3	500	31	②
1	450	35	⑥
3	450	31	④
1	250	31	②
2	275	19	②
10	225	13	⑦
9	225	11	⑩
4	225	13	⑪
8	175	10½	Bulkhead on SW side of Reference ②
47			

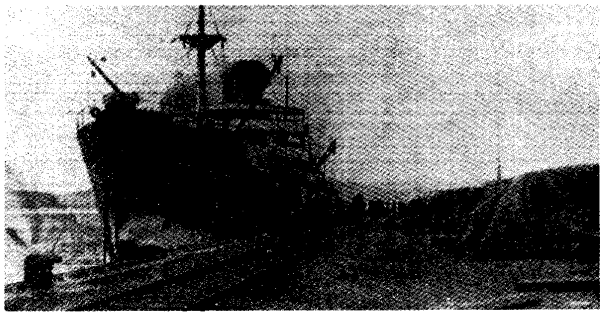

FIGURE VI - 8. *Najin.*
Keian Maru (280-foot long, 18-foot draft) berthed at one of the main piers, probably Pier No. 1 (Reference ⑥), before 1936. Warehouses since built.

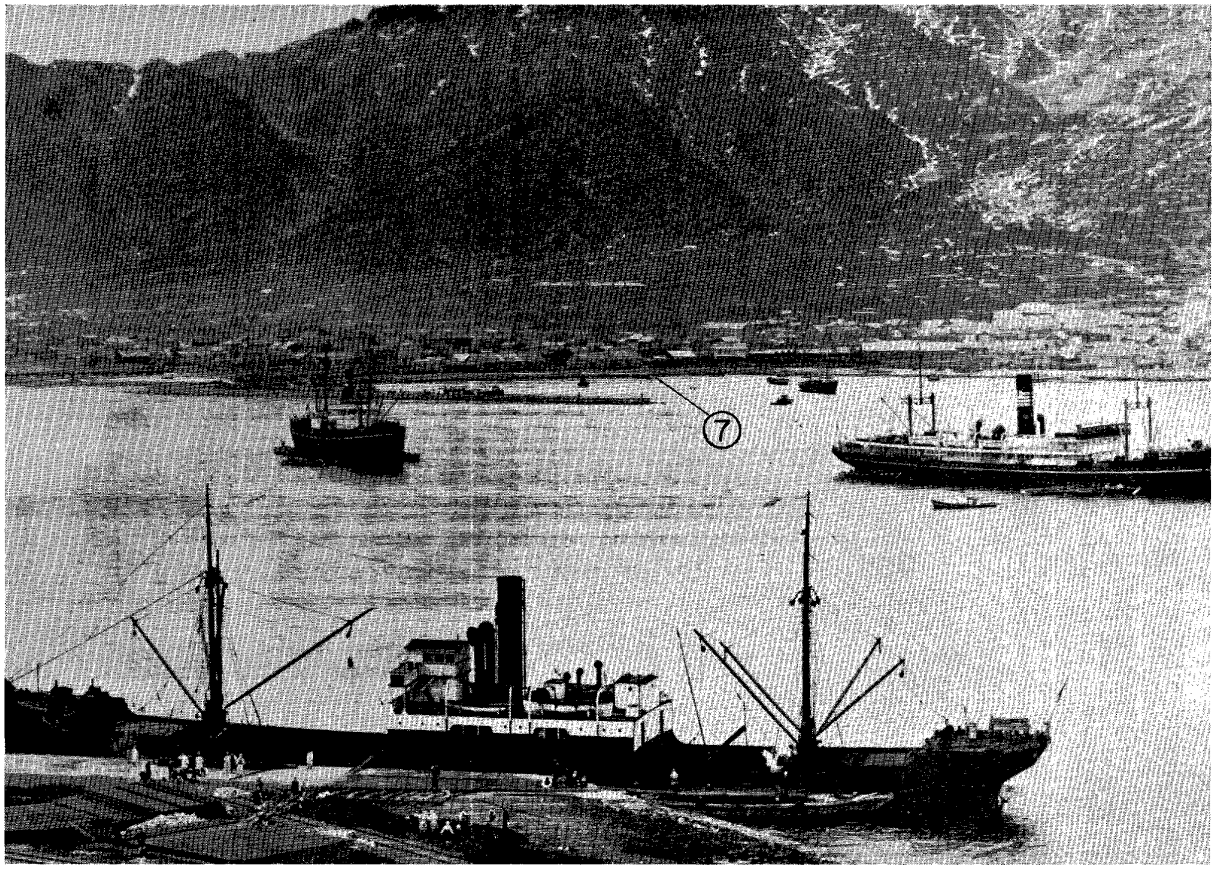

FIGURE VI - 9. *Najin.*
N end of East Wharf No. 1 (Reference ⑩), looking westward across harbor to breakwater protecting Main Quay (Reference ⑦).

Table VI - 4 does not include 2 possible berths for 450-foot ships drawing over 30 feet; each of these berths would be at the bulkhead wharves (References ③⑤) between the 3 existing piers (References ②④⑥). If the berths alongside the piers are being used, the bulkhead wharves between the piers probably would not be accessible. However, TABLE VI - 4 does include berthage for eight 175-foot vessels drawing 10½ feet along the bulkhead wharfage extending southwestward from Pier No. 3 (Reference ②). This wharfage is the site of the projected construction of 4 new piers. In addition to the berths listed in TABLE VI - 4, there are at least 5,400 feet of additional quayage for small craft.

The 3 known piers (References ②④⑥) are equipped with camels (breasting-off devices), have warehouses, and are serviced by railroad spurs. Little information is available with regard to mechanical handling facilities; one report says there is a large traveling crane on each pier, but another report says that only one land crane of 25-ton capacity and 2 floating

cranes of 30-ton and 50-ton capacities are available in the harbor. In 1938, the aggregate lighter tonnage was reported to be 1,000 tons. One small tug, 1 larger tug of 800 horsepower, and two 50-foot launches were reported. The large tug, owned by the South Manchurian Railways, was generally used for berthing.

Depths in the following tabulation of details of Najin's landing facilities are from Japanese charts.

Pier No. 1 (Reference ⑥); details follow:

Location:	On W side of harbor.		
Purpose:	General cargo.		
Construction:	Reclaimed-land type. Concrete retaining solid fill.		
	Face	N side	S side
Length:	406′	1,100′	985′
Depth alongside:	35′	31′	31′
Berthage:	One 7,500-ton vessel drawing 35′.	Two 10,000-ton vessels drawing 31′.	Two 10,000-ton vessels drawing 31′.
Capacity (lbs. per sq. ft.):	Probably unlimited.		
Storage:	3 large godowns reported. No data on size. Small passengers' luggage shed on upland.		
RR and roads:	At least 4 tracks reported—2 between the sheds, 1 on each apron. May have 4 tracks between warehouses and 2 on S apron. Road connections also available.		
Unloading capacity:	2,900 long tons per day.		
Remarks:	Cargo believed expeditiously handled, with loading largely done to and from freight cars.		

Wharf A (Reference ⑤); details follow:

Location:	Bulkhead between Piers Nos. 1 and 2.
Purpose:	General cargo.
Construction:	Reclaimed-land type. Concrete retaining solid fill.
Length:	623′.
Depth alongside:	31′.
Berthage:	One 8,000-ton vessel drawing 31′; probably not accessible when berths on adjacent piers are occupied.
Capacity (lbs. per sq. ft.):	Probably unlimited.
Storage facilities:	1 or 2 large warehouses.
RR and roads:	At least 1 spur between warehouses may be double-tracked. Road connections available.
Unloading capacity:	600 long tons per day.

Pier No. 2 (Reference ④); details follow:

Location:	Between Piers Nos. 1 and 3 on W side of harbor.		
Purpose:	General cargo.		
Construction:	Reclaimed-land type. Concrete retaining solid fill.		
	Face	N side	S side
Length:	406′	985′	985′
Depth alongside:	31′	31′	31′
Berthage:	One 7,500-ton vessel drawing 31′.	One 10,000-ton vessel and one 7,500-ton vessel drawing 31′.	One 10,000-ton vessel and one 7,500-ton vessel drawing 31′.
Capacity (lbs. per sq. ft.):	Probably unlimited.		
Storage:	3 large godowns reported. No data on size.		
RR and roads:	1 track between warehouses and maybe 1 on S apron.		
Unloading capacity:	2,900 long tons per day.		
Remarks:	Cargo believed expeditiously handled, with loading largely done directly to or from freight cars.		

Wharf B (Reference ③); details follow:

Location:	Bulkhead between Piers Nos. 2 and 3.
Purpose:	General cargo.
Construction:	Reclaimed-land type. Concrete retaining solid fill.
Length:	754′.
Depth alongside:	31′.
Berthage:	One 8,000-ton vessel drawing 31′, probably not accessible when berths on adjacent piers are occupied.
Capacity (lbs. per sq. ft.):	Probably unlimited.
Storage facilities:	Probably 1 large warehouse.
RR and roads:	1 track may be behind warehouse.
Unloading capacity:	600 long tons per day.

Pier No. 3 (Reference ②); details follow:

Location:	On W side of harbor.		
Purpose:	General cargo.		
Construction:	Reclaimed-land type. Concrete retaining solid fill.		
	Face	N side	S side
Length:	262′	1,640′	720′
Depth alongside:	31′	31′	19′ to 27′
Berthage:	One 1,700-ton vessel drawing 31′.	Three 10,000-ton vessels drawing 31′.	Probably two 2,500-ton vessels drawing 19′.
Capacity (lbs. per sq. ft.):	Probably unlimited.		
Storage:	Probably 3 large warehouses.		
RR and roads:	May have 1 track on N apron. Road connection available.		
Unloading capacity:	3,100 long tons per day.		
Remarks:	Bulkhead extends southwestward from S side to ship repair yard; has 3 sections with total length of approximately 1,800′; depths alongside 10½′. Believed can berth 8 coasters, each 175′ long. Cargo at pier believed expeditiously handled, with loading largely done directly to and from freight cars. S side of pier not definitely known to be in use.		

Main Quay (Reference ⑦); details follow:

Location:	Along NW shore of harbor, northward of Pier No. 1.
Purpose:	Handling small craft.
Construction:	In 3 sections.
Length:	590′ plus 855′ plus 2,495′.
Depth alongside:	590′ section, about 7′; 855′ section, about 3′; and 2,945′ section, dredged to 13′.
RR:	4 spurs on upland and 1 track along quay.
Berthage:	2,495-ft. section could accommodate ten 1,200-ton vessels drawing 13′. However, at least 1,000′ of deeper water berthage is reported available in section fronted by 2 breakwaters (425′ and 1,245′) which form a protected basin.

East Wharf No. 1 (Reference ⑩); details follow:

Location:	On E side of harbor.		
	Face	N side	S side
Length:	2,100′	425′ approx.	425′ approx.
Depth alongside:	11′	—	—
Berthage:	Based on present depth data, nine 1,200-ton vessels drawing 11′; some reports give depths in excess of those on available charts, but the deeper depths might be only part of the projected development program.		
RR:	Spur runs length of wharf.		

East Wharf No. 2 (Reference ⑪); details follow:

Location:	On E side of harbor, southward from East Wharf No. 1.
Length:	1,505′.
Depth alongside:	10′ to 13′.
Berthage:	Probably four 1,200-ton vessels drawing 13′. Deeper depths may be part of projected harbor improvement; see "Berthage" under East Wharf No. 1.
RR:	Spur runs length of wharf.

New Quay (Reference ⑨). In 1942, in this area along the northeast head of the bay, land was being reclaimed, and a 984-foot breakwater was under construction about 320 yards offshore. A reliable Japanese source says this activity was part of a program to construct commercial installations. Scheduled completion date was probably 31 March 1944. If now completed, approximately 980 yards of new quayage, served by a railroad spur, is available.

(3) ***Storage facilities.***

Only vague data is available on storage facilities. Godown accommodation in June, 1938, was estimated at 40,000 tons, with open storage available for a similar amount (These estimates are prior to erection of storage facilities on Pier No. 3 (Reference ②)); large 3-story warehouses were reported inland at the northeast end of the harbor; and scattered warehouses were reported near the old village of Najin-dong.

(4) ***Capacity and clearance.***

(*a*) *Estimated unloading capacity.* The estimated total unloading capacity of the port is 25,100 long tons per day—10,100 long tons discharged alongside and 15,000 long tons worked in the stream by 30 Liberty ships. The New Quay (Reference ⑨) has been used in estimating the amount of cargo worked by Liberty ships in the stream.

(*b*) *Facilities for clearing port. Railroad.* The Najin - Hsin-pin (Hsing-ching) (Manchuria) rail line, connects with the port of Unggi and with the numerous and recently developed branch lines of the South Manchurian Railways. A coastal line has been under construction and is probably completed southward to Ch'ongjin. The line from Unggi comes into town from the northward; south of a marshalling yard and roundhouse, it branches to form a harbor belt line. Tracks are on 2 piers (References ④⑥), may be on the third pier (Reference ②), and tracks serve the quays and wharves (References ⑤⑦ ⑨⑩⑪).

Road. Najin is connected by serviceable roads with Manchuria via Unggi and T'u-men. A macadamized road runs southward to Ch'ongjin. Streets run on or near the 3 piers (References ②④⑥), the Main Quay (Reference ⑦), and probably the new quay (Reference ⑨), but details of road or street connections with the 2 wharves on the eastern side of the harbor (References ⑩⑪) are not available. A stream crossed by bridges runs through the town.

(5) ***Supplies.***

(*a*) *Water.* The water supply for Najin is reported to be a small river (name unknown) about 20 miles south of the city. A five-inch pipe line, paralleling the macadam road from Ch'ongjin on the inland side, leads to the city. Nothing is known of the water's quality. Also, fresh water is believed available at all the main terminals, or it can be supplied by a water-boat of 40 tons capacity.

(*b*) *Oil.* Oil storage tanks at Najin, capacity unknown, are reported as follows: for military use at Najin-dong; behind the 3 piers; and near the Cavalry Remount Depot, northwestward of town.

(*c*) *Coal.* No figures are available on the coal supply maintained at the port. However, it seems that coal could be supplied if ordered from Aoji-dong, north of Najin.

(*d*) *Electricity.* Much of the supply is furnished by the Puryong Project, Hamgyong-pukto, which has a combined capacity of 28,000 kilowatts produced by 2 plants, but within the city itself, a large electric light plant has been erected.

(6) ***Repair facilities.***

One marine railway for the repair of small boats (Reference ⑧) is about 200 yards west of the Najin-gang. A second marine railway (Reference ①) is indicated on the latest Japanese chart. No details are available.

C. Ch'ongjin (Seishin).
(41°46'N, 129°49'E)

Ch'ongjin (Seishin) is in the northeastern corner of Kyongsong-man, a large open bay which indents the northeastern coast of Korea between Orang-dan (Gyorō-tan) and Komala-san-dan (PLAN 5). It handles some of the traffic between Japan and Manchuria, and is one of the leading iron and steel centers in Korea. In addition, it has a large fishery-products and bean oil industry; the former is now reported as being principally devoted to production of glycerine. The port is the major outlet for the Musan iron mines, the largest in Korea, which are 43 miles northward of Ch'ongjin.

The port has 3 harbors: Commercial Harbor, the only one that can accommodate deep-draft vessels, fronts the city proper; and 2 industrial harbors have been developed southwestward of the city to accommodate lighters and shallow-draft vessels serving nearby industrial developments. Quays and a mole in the commercial harbor can berth 10 vessels—eight drawing 26 feet or more, one drawing 23 feet, and one drawing 16 feet. One industrial harbor has 9,500 feet of quayage with 11½-foot depths alongside; and the second industrial harbor, still under construction, may eventually handle larger ships. It already has 6,500 feet of quayage in operation. Adequate rail and road clearance is available.

Breakwaters protect the 3 harbors; Commercial Harbor has depths from 10 to 55 feet; depths in one industrial harbor are 7 to 16 feet; and depths in the second industrial harbor are not known, but are believed to be shallow. The harbor area in general is protected from the north and northeast by hills on the mainland and adjacent peninsula, but the harbor area is open to the southward and subject to occasional heavy swells in summer. There is anchorage in the northeast portion of the harbor area; depths outside the breakwaters range from 5½ to 19 fathoms, mud and sand bottom. The harbor area probably can provide 35 first-, 7 second-, and 8 third-class anchorage berths; four 8,000-ton ships can be accommodated at anchorage berths inside Commercial Harbor.

The estimated unloading capacity for all 3 harbors is 19,400 long tons per day—4,400 long tons discharged alongside landing facilities in Commercial Harbor and the rest handled offshore by 30 Liberty ships.

Nearby rivers freeze in winter, but ice is rarely a navigational problem in the harbor area.

(1) ***Harbor.***

Ch'ongjin has 3 harbors (FIGURE VI - 10): The old port, or Commercial Harbor, fronting the city, is designated on FIGURE VI - 10 by an encircled letter C.

A shallow-depth Industrial Harbor, fronting a new industrial area extending northeastward from the mouth and the northeastern bank of the river, Susong-ch'on (Yūjo Sen), is designated on FIGURE VI - 10 by an encircled letter B.

A new shallow-depth Industrial Harbor, under construction near the Japan Iron Works southwestward of the mouth and the southwest bank of the river, Susong-ch'on (Yūjo Sen), is designated on FIGURE VI - 10 by an encircled letter A.

The whole harbor area is well protected from the north and northeast winds of winter by the hills of the mainland and peninsula, but it is open to the southward and subject to occa-

sional heavy swells in the summer. All 3 harbors require artificial protection to the south.

The Commercial Harbor C, the only one able to handle large vessels, is in the northeast corner of the harbor area, at the angle formed by the base of a peninsula, Komalsan-dan (Kō-matsusan-tan), and the mainland. Bounded by the mainland on the north and the peninsula to the eastward, it has a two-section breakwater on the south: the landward section extends westward from the peninsula about 245 feet; and the seaward section (Reference ㉙*), which is separated from the landward portion by a narrow gateway, extends 1,970 feet farther westward. The area thus enclosed is divided into 2 sections by the Coastal Trading Mole (Reference ㉓), which juts more than 900 feet southward from the mainland almost to the short landward section of the south breakwater.

Eastward of this mole is a small vessel section of the Commercial Harbor covering a water area of 49,600 square yards and affording anchorage and berthing space to small fishing vessels and lighters in depths of 10 to 20 feet. Westward of this mole is the new and principal section of the Commercial Harbor, covering an area of 434,148 square yards and accommodating large vessels in depths of from 26 to 55 feet.

Westward of the Commercial Harbor an extensive reclamation and improvement project has been started; the mouth of the Susong-ch'on has been moved about 1½ miles to the west, and the old delta area filled in for factory sites; a canal has been put through the old course of the river so that the river now has 2 outlets a little over a mile apart; and 2 shallow-depth artificial harbors have been constructed, one just northeastward of the new river mouth, and one just southwestward of it.

Industrial Harbor B is in the center of the big industrial development on the reclaimed area northeastward of the new river mouth. The outer portion of the harbor covering a water area of 224,400 square yards, with depths of from 7 to 16 feet, is formed by a long seawall and breakwater running 2,750 feet southwestward from the eastern limit of the harbor, and a training pier extending 1,000 feet southward from the western limit. The inner harbor, covering a water area of 121,274 square yards, with 11½-foot depth, is a dredged basin enclosed by retaining walls.

Industrial Harbor A, still under construction, is just across the river from Industrial Harbor B. Somewhat similar to Industrial Harbor B, it consists of an outer portion bounded on the south by a 1,200-foot breakwater and on the east by a 1,000-foot mole (Reference ②), from which extends a 3,000-foot breakwater. It has an irregularly-shaped inner section lined with quays and bulkheads. The outer portion covers a water area of about 730,000 square yards, and the inner section, still incomplete, covers an area of approximately 300,000 square yards. Depths in this harbor are unknown; aerial photographs show only small coasters and lighters present, so that it may be assumed that depths are roughly comparable to those in Industrial Harbor B.

(*a*) *Entrance channels.* The entrance to the harbor area is free and open, and is made from the south or southwest. The Commercial Harbor is entered from the southwest, between the south breakwater (Reference ㉖) and the mole designated as Quay No. 3 (References ⑱⑲); the entrance is about 400 yards wide with depths of 40 to 55 feet. About 150 yards south of the main quays, depths shoal slightly to 29 and 30 feet.

The small vessel section in the eastern portion of the Commercial Harbor is entered from the west, between the south breakwater (Reference ㉖) and the Coastal Trading Mole (Reference ㉓); the entrance is some 100 yards wide, with depths of 30 feet quickly shoaling to about 10 feet in the northern portion of the basin.

The entrance to Industrial Harbor B, 2½ miles westward of the Commercial Harbor, is from the southwest, between the training wall on the southwest and the breakwater about 650 feet to the northeast; depths in the fairway range from 18 feet at the entrance of the outer portion to 7 feet at the entrance to the inner portion.

Industrial Harbor A is entered from the south, between the south and east breakwaters; the entrance is about 330 yards wide, depths unknown.

(*b*) *Anchorage.* There is safe anchorage for large vessels in the northeastern portion of the harbor area. Depths outside the breakwater areas range from 5½ to 19 fathoms, mud and sand bottom. The general harbor area probably can provide 35 first-, 7 second-, and 8 third-class anchorage berths.

Inside the breakwater area of the Commercial Harbor, four 8,000-ton ships can be accommodated at anchorage berths close northward of the long south breakwater (Reference ㉖) in depths of over 30 feet; harbor plans call for 4 mooring buoys here, but only 3 have been reported.

Anchorage for small vessels is probably available in the outer portions of both Industrial Harbor B and Industrial Harbor A.

On the northeastern side of the peninsula, Komalsan-dan, there is a small fishing harbor, (encircled D on FIGURE VI - 10) which affords anchorage exposed to north and northeast winds for small craft in 10 feet of water.

(*c*) *Significant hydrographic features.* The mean high water interval is 2 hours and 54 minutes, and the spring and neap rise is but 11 inches. The mean level above datum is about 10 inches. A small tidal current is commonly encountered by vessels approaching the harbor from the south; the current sets inshore towards the mouth of the Susong-ch'on at a rate of ½ to 3 knots and is most likely to be experienced during east and south winds and in the seasons of thick fog or snow.

(*d*) *Local weather.* Although rivers freeze in the winter, ice is rarely a navigational problem in the harbor area. Very occasionally a thin film of ice has covered an area in Commercial Harbor within the south breakwater (Reference ㉖), but not with sufficient thickness to impede navigation. During the spring thaw there is frequently drift ice in the mouth of the bay, but again it does not offer serious interference.

During the foggy season, from April until early August, east winds from the Sea of Japan sometimes bring a fog dense enough to interrupt navigation for several days. Strong southwesterly winds which sweep into the open bay during the summer months occasionally cause heavy seas and make anchorage outside the breakwater area difficult. However, wind and sea of such magnitude are rare. Although wind velocity occasionally exceeds 60 miles per hour, the mean velocity of the wind during the worst months, from October through April, is only 12.3 miles per hour.

* Encircled numbers are references on FIGURE VI - 10.

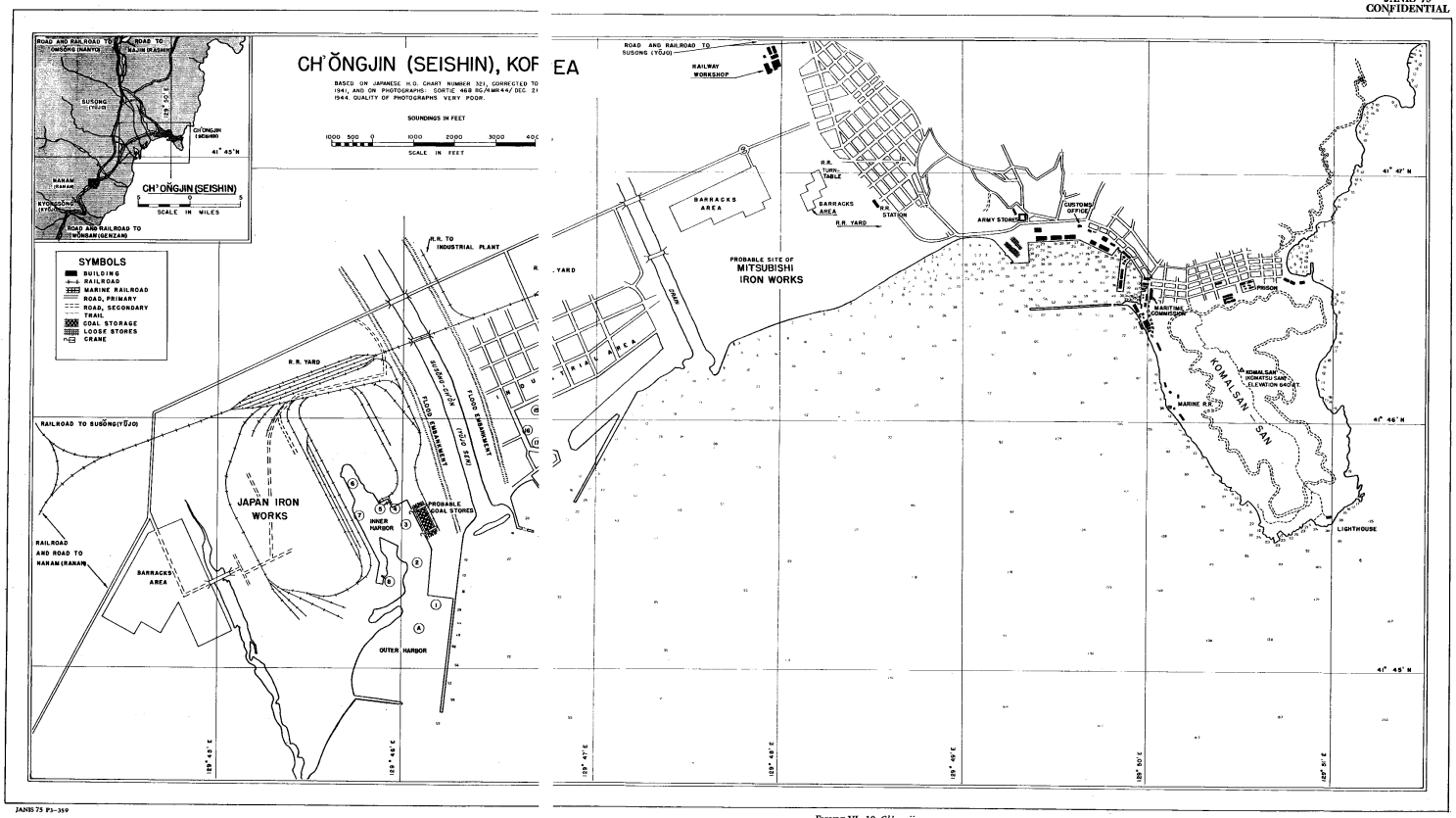

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FIGURE VI - 10. *Ch'ongjin.*
Port plan showing location of facilities by encircled reference numbers and letters.

(2) ***Landing facilities.***

The only landing facilities at Ch'ongjin capable of handling large vessels are in the Commercial Harbor; most of the deep-draft berthing facilities are westward of the Coastal Trading Mole (Reference ㉓). Eastward of this mole, the facilities in the Commercial Harbor are primarily for smaller craft. Industrial Harbors A and B have facilities for shallow-draft vessels which serve newer industrial developments southwestward of the city proper. TABLE VI - 5 gives the distribution of the 10 major vessel berths in the Commercial Harbor.

TABLE VI - 5
DISTRIBUTION OF MAJOR VESSEL BERTHS IN COMMERCIAL HARBOR, CH'ONGJIN

No. of Vessel Berths	Vessel Lengths	Allowable Drafts	Location by Reference Nos. on Figure VI - 10
1	350′	31′	⑲
1	480′	29′	⑳
2	480′	28′	㉑
1	320′	28′	㉑
2	400′	26′	㉒
1	320′	23′	㉓ W side
1	225′	16′	㉓ E side
1	365′	29′	㉕
10			

Industrial Harbor B was originally intended to take care of the large fish-products industry at Ch'ongjin, and its quays are lined with fish-products factories and warehouses, but the recent development of the Mitsubishi Iron Works plant across the canal just northeastward probably means that some of the harbor facilities are used to handle iron ore and pig iron. This shallow inner basin has more than 9,500 feet of quayage in 11½ feet of water.

Industrial Harbor A, still under construction, probably was designed to serve the Japan Iron Works plant, westward of the inner portion of the harbor. Interpretation of aerial photographs indicate that its facilities may eventually handle larger vessels than can be accommodated in Industrial Harbor B. In December 1944, about 6,500 feet of quayage were completed and in operation in Industrial Harbor A.

In 1931, two cranes—a 10-ton and a 1½-ton—were reported available in the Commercial Harbor. Hoisting facilities might be available in Industrial Harbor B, but available aerial photographs are too poor to permit precise identification. Loaders on 2 traveling cranes are on the quay, Reference ③, in Industrial Harbor A.

In 1930, there were 73 lighters at Ch'ongjin, ranging in size from 15 to 80 tons, with a total tonnage of 3,158. There were also about 11 tugs of varying sizes and types, including one 36-ton and four 4- to 10-ton motor boats belonging to the port, and 4 tugs for use by private companies.

(*a*) *Commercial Harbor.* The main quays in Commercial Harbor total about 3,000 feet and have depths alongside ranging from 26 to 32 feet (FIGURE VI - 11).

Quay No. 1 (Reference ㉒); details follow:

Location:	N side of Commercial Harbor.	
Purpose:	General commerce.	
Construction:	Stone rubble, faced with wood pilings. Concrete deck.	
	SE side	SW side
Length:	282′	885′
Depth alongside:	9 to 14′	26′
Berthage:	Two 6,000-ton vessels at SW side; small craft at SE side.	
Storage:	1 wooden customs shed 264′ by 100′ and 1 wooden customs shed 150′ by 100′ on SW side of quay. 1 brick warehouse 150′ by 100′ on NE side. Medium-sized open storage area around warehouses.	
RR and roads:	RR spur back of customs sheds. Paved street parallels quay.	
Unloading capacity:	1,000 long tons per day.	
Remarks:	3 water hydrants; 1 solid feed line, 2 hoses. Lighted.	

Quay No. 2 (Reference ㉑); details follow:

Location:	N side of Commercial Harbor, just W of Quay No. 1.
Purpose:	General commerce.
Construction:	Stone rubble, faced with wood pilings. Concrete deck.
Length:	1,279′.
Depth alongside:	26′ to 29′.
Berthage:	Two 8,000-ton ships; one 3,200-ton ship.
Storage:	3 wooden customs sheds 264′ by 100′; 1 warehouse 158′ by 70′ behind. Storage yards.
RR and roads:	1 RR spur behind 3 customs sheds and one back of warehouse. Paved street parallels quay.
Estimated terminal capacity:	1,200 long tons per day.
Remarks:	Lighted.

Quay No. 3 (E side Reference ⑳; S side Reference ⑲; and W side Reference ⑱); details follow:

Location:	N side of Commercial Harbor, adjoining W of Quay No. 2.	
Purpose:	General commerce.	
Construction:	Filled mole faced with concrete bulkheads.	
	E side	S side
Length:	492′	344′
Depth alongside:	29′	32′
Berthage:	One 8,000-ton ship on E side; one 3,500-ton ship on S side.	
Width of apron:	800′.	
Storage:	No warehouses but large quantity of open stores disclosed in aerial coverage.	
RR:	4 tracks on apron, 2 serving each vessel berth.	
Unloading capacity:	1,000 long tons per day.	
Remarks:	W side bulkheaded for 1,680′ with depths of 3 to 22′ alongside, but does not seem to have been used as yet for vessel berths. E and S side berths possibly lighted.	

South Quay (Reference ㉕); details follow:

Location:	Southern limit of small vessels harbor, just eastward of entrance.
Purpose:	General commerce.
Construction:	Concrete.
Length:	430′
Depth of water:	20′ to 30′.
Berthing space available:	One 4,500-ton vessel.
Storage facilities:	1 warehouse 85′ by 215′ on quay.
Road:	Paved street which follows waterfront runs close inland of quay.
Unloading capacity:	400 long tons per day.

The small vessels section of the Commercial Harbor includes the Coastal Trading Mole (Reference ㉓) and the east quay (Reference ㉔). Including both eastern and western sides of the Coastal Trading Mole (Reference ㉓), there are 2,300 feet of wharfage in the small vessels section of the Commercial Harbor. Coasters of up to 1,200 tons can berth on the eastern side of the southern portion of the mole, where depths run from 16 to 26 feet, and one large coaster as well as several smaller vessels can berth alongside the western side, where depths are slightly greater, but elsewhere in the small vessels section of the Commercial Harbor, with the exception of the south quay (Reference ㉕), depths are insufficient for any but very small vessels.

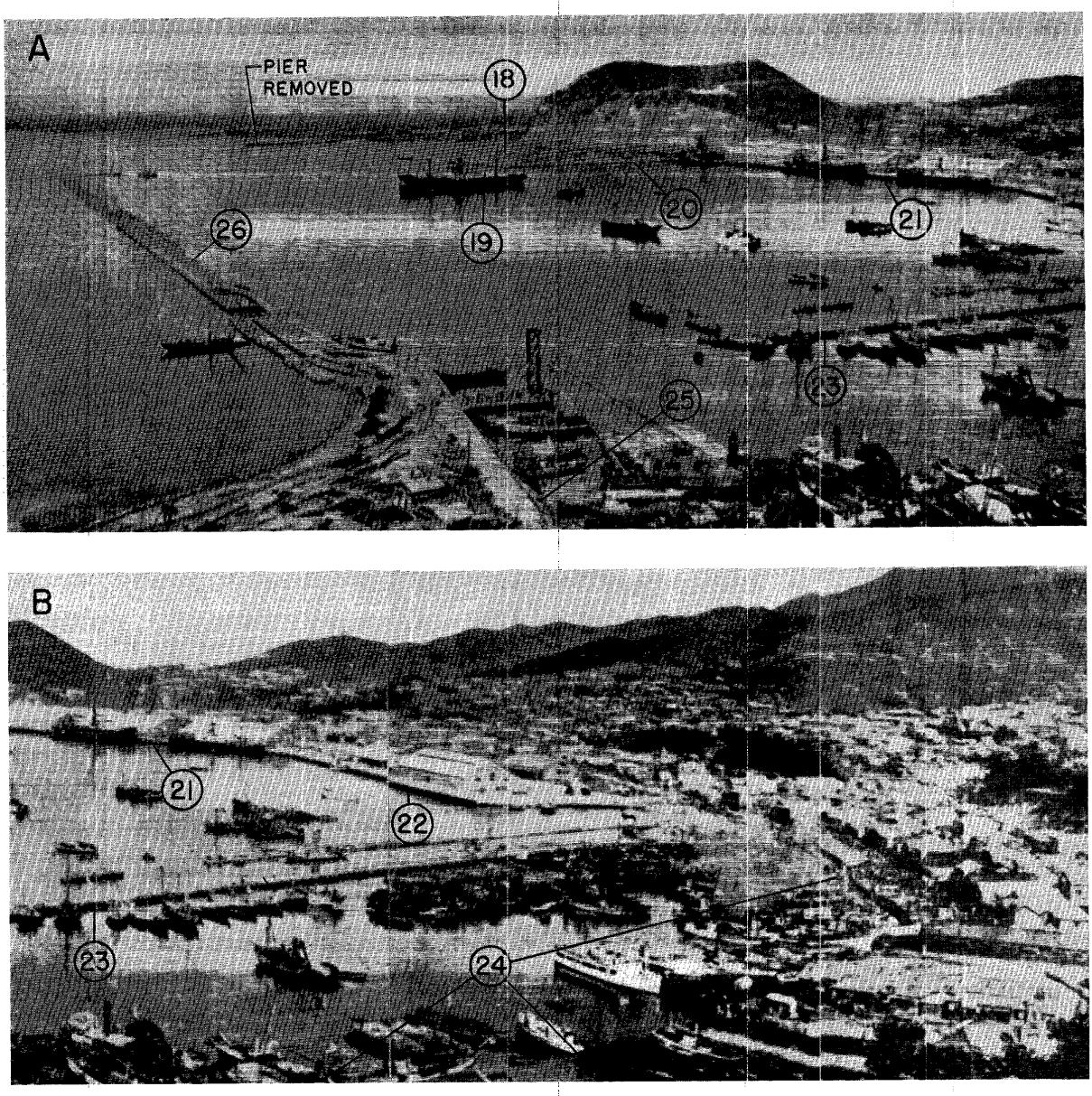

FIGURE VI - 11. *Ch'ongjin.*
Panorama of Commercial Harbor, looking northwestward, 1935. Coastal Trading Mole (Reference ㉓) and south quay (Reference ㉕) under construction.

The east quay (Reference ㉔), 600 feet long, has depths of 10 and 11 feet alongside; it is split into 2 sections by the Taiwa Machi customs landing; the northern section is 265 feet long, and the southern 335 feet. Depths are about 13 feet alongside. Two good-sized sheds are on the Coastal Trading Mole (Reference ㉓) and a number of others scattered among the small industries on the northeastern and eastern sides of the small vessels section of the Commercial Harbor. This area of the port is served by a paved roadway which borders the waterfront.

Coastal Trading Mole (Reference ㉓); details follow:

Location:	Eastern portion of Commercial Harbor.
Purpose:	General commerce.
Construction:	Concrete bulkheaded mole.

	Face	E side	W side
Length:	160′	885′	950′
Depth alongside:	32′	10′ to 26′	9′ to 35′

Berthage:	E side: one 1,200-ton vessel and miscellaneous small craft. W side: one 3,000-ton vessel and one 500-ton vessel.
Storage:	1 warehouse 65′ by 280′ and 1 warehouse 65′ by 215′ are on the mole. Inland of mole are 6 smaller warehouses.
Road:	Mole adjoins paved street which follows waterfront.
Unloading capacity:	800 long tons per day.
Remarks:	The Coastal Trading Mole is a recent improvement. Formerly there were only 2 parallel breakwaters at this location. The Mole is lighted.

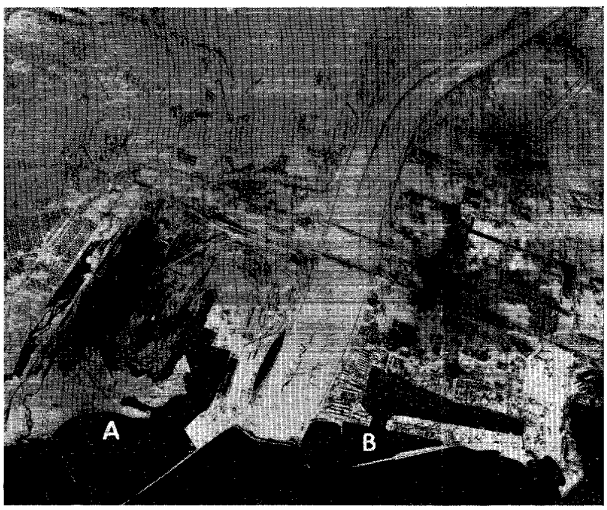

FIGURE VI - 12. *Ch'ongjin.*
Aerial oblique of Industrial Harbors A and B, looking northwestward. December 1944.

(*b*) *Industrial Harbor B.* The landing facilities at Industrial Harbor B are confined to the inner basin, which has more than 9,500 feet of quayage with 11½-foot depths alongside (FIGURE VI - 12). Fish-products factories and warehouses line the western and northern quays (References ⑭⑮⑯⑰⑩) and aerial photographs reveal new installations on the eastern quays (References ⑨⑫⑬). These new installations probably are connected with the nearby Mitsubishi Iron Works, but available aerial photographs are too poor to permit precise identification, particularly of possible storage and hoisting facilities. Road and rail connections to the main railroad and highway routes a short distance northward are available. Following is a summary of information on landing facilities at Industrial Harbor B, based upon an interpretation of aerial coverage.

Eastern side (References ⑨⑫⑬):

Reference ⑨—1,300 feet not quayed. Possibly a small boat yard.

Reference ⑫—3,000-foot quay. 120-foot coaster and small craft alongside.

Reference ⑬—420-foot quay. Unidentified installations and buildings surround this portion of the harbor. Single track RR spur runs eastward of harbor and 1,600 feet onto eastern breakwater, connecting northward with marshalling yard on main line.

Northern side (References ⑭⑮):

Reference ⑭—1,800-foot quay. Small craft moored at right angles to quay.

Reference ⑮—2,000-foot quay. Small craft moored at right angles to quay. Fishery products companies on both quays and other industries landwards. Roads connect with main highway a short distance northward.

Western side (References ⑯⑰⑩):

Reference ⑯—1,000-foot quay. Possibly 3 boat landings.

Reference ⑰—325-foot quay.

Reference ⑩—600-foot quay. These 3 quays serve fishery products companies just inland. Adequate road connections.

(*c*) *Industrial Harbor A.* Still under construction, this harbor has 6,500 feet of quayage already completed and in operation, according to interpretation of aerial photographs of 21 December 1944 (FIGURE VI - 12). This harbor is as yet uncharted, and information on it is based solely upon aerial coverage of very poor quality. No warehouses appear to have been built yet, but large open dumps of coal and ore are just inland of quays, References ③ and ⑦. Loaders on 2 traveling bridge cranes are on the quay, Reference ③. Quays, References ⑤ and ⑦, appear to be busiest; there were 12 barges or lighters alongside Reference ⑤ and 10 lighters and a smaller coaster alongside Reference ⑦. Just inland of these 2 quays is the large Japan Iron Works plant. Road and rail clearance is available for all quays. Following is a summary of available data on landing facilities in Industrial Harbor A, based upon an interpretation of aerial coverage.

Outer Harbor: No vessels alongside breakwaters or 2,600-foot undeveloped western shore line.

Inner Harbor:

Reference ①—550-foot quay not complete. Probably intended for large vessels. Small craft moored at right angles to quay.

Reference ②—1,000-foot quay unfinished.

Reference ③—1,450-foot quay completed. Probably intended for coasters. Coal or ore loaders on 2 traveling bridge cranes on quay. Large coal or ore dump just inland. RR spur to loaders connects northward with sizable marshalling yard and main line.

Reference ④—510-foot quay, possibly incomplete.

Reference ⑤—Quay E and N sides 420 feet. Very active; 12 craft alongside. RR spurs to E and N sides.

Reference ⑥—Basin under construction. W side quayed 600 feet.

Reference ⑦—1,600-foot quay completed. 10 small craft and coasters alongside. 4 RR spurs. Japan Iron Works plant a short distance westward. Large oil stores on quay. Probably used for loading ore and pig iron.

Reference ⑧—Basin under construction. W side quayed 400 feet. Land directly eastward of basin in process of being removed as part of harbor construction program.

(*d*) *Other landing facilities.* A small industrial quay (Reference ㉗) fronts a factory a short distance south of the south breakwater (Reference ㉖). The north and south sides of the quay are 43 feet and the face 86 feet, with depths of about 37 feet alongside. The factory just inland of it is 115 feet by 135 feet (FIGURE VI - 13).

The coaling pier shown on all charts just westward of the Commercial Harbor is no longer in existence, according to interpretation of aerial coverage. Formerly a good sized coal dump and lumber yard were inland of this pier, but they too have disappeared as the harbor improvement program has progressed.

(3) *Storage facilities.*

The principal storage facilities of Ch'ongjin are concentrated on the Commercial Harbor facilities, and consist almost entirely of one and two-story wooden and brick warehouses with a total ground area of about 215,000 square feet. Largest of these warehouses are the five which line Quays Nos. 1 and 2 (References ㉑ and ㉒); directly behind them are 2 medium-sized

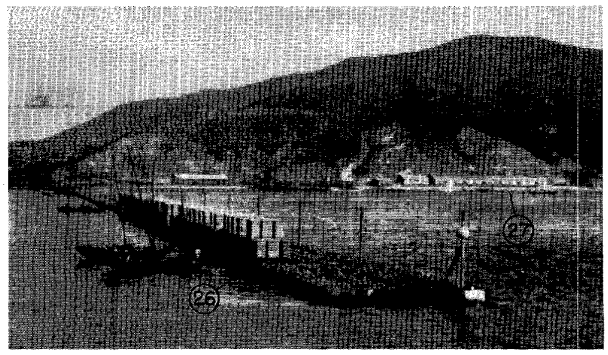

FIGURE VI - 13. *Ch'ongjin.*
South breakwater (Reference ㉖) and industrial quay (Reference ㉗), looking east-southeastward. 1933. New buildings have been constructed behind industrial quay (Reference ㉗).

warehouses. Two more warehouses are on the Coastal Trading Mole (Reference ㉓) and 6 smaller ones are inland from the Mole. Other warehouses scattered along the eastern quay (Reference ㉔) of the small vessel section of Commercial Harbor are smaller and older. TABLE VI - 6 lists the distribution of known warehousing facilities at Commercial Harbor.

In the warehouse area of Commercial Harbor there is about 150,000 square feet of open storage space; latest aerial photographs disclose a large number of open stores on Quay No. 3 (References ⑱⑲⑳).

Storage facilities on Quays No. 1, 2 and 3 (References ⑱⑲⑳㉑㉒) are served by railroad spurs which connect directly with the main line. Other ware houses in Commercial Harbor are a short distance eastward of the end of the harbor belt line, and are afforded easy access to it by the broad paved street which parallels the northern and eastern shores of the harbor

Information on storage facilities at Industrial Harbors A and B is scanty, and depends entirely on the results of interpretation of very poor aerial photographs. The quays of Industrial Harbor B are lined with warehouses, but the quality of available photographs does not permit estimation of their size or capacity. These warehouses have direct access via roadway and railroad spurs to both the main highway and railroad line.

Storage facilities at Industrial Harbor A are at present largely confined to open storage yards. The largest ones are on the northeast and northwest quays (References ③ ⑦) of the inner portion of the harbor. Whether the loaders on 2 traveling bridge cranes on the northeast quay are handling coal or iron ore is not clear from available aerial photographs. Plate and ore are probably stored just inland of the northwest quay (Reference ⑦). All storage areas in Industrial Harbor A are accessible by both road and railway.

(4) Capacity and clearance.

(a) Actual annual traffic. In 1938, eight hundred and nineteen vessels totaling 1,245,000 gross tons called at the port.

(b) Estimated unloading capacity. The estimated unloading capacity for all 3 harbors at Ch'ongjin is 19,400 long tons per day—4,400 long tons discharged alongside the landing facilities in Commercial Harbor, and 15,000 long tons handled offshore by 30 Liberty ships.

(c) Facilities for clearing port. Railroad. The standard-gauge railroad which connects Ch'ongjin with Susong and the main line of the Korea East Coast Railway comes down from the north to the railroad station at Ch'ongjin. Just northward of the railroad station and roundhouse, the line loops to the west-southwestward running some distance behind the new industrial development and Industrial Harbors A and B. Westward of the Japan Iron Works, the line turns northward again to Susong; the line from Nanam connects with the Ch'ongjin-Susong line at this point.

This loop to the west-southwestward serves the Mitsubushi Iron Works, crossing a canal bridge, and sends a spur southward from a small marshalling yard to serve Reference ⑬, and perhaps Reference ⑫, in Industrial Harbor B. West-southwestward of the small yard, the line crosses a river bridge into a large marshalling yard. Extensive spurs from this yard serve the Japan Iron Works and Industrial Harbor A, particularly References ③⑤⑦. Open stores indicate that coal and/or ore are handled at References ③ and ⑦. The former has loaders on 2 traveling bridge cranes.

A belt line serving the Commercial Harbor turns eastward a short distance southward of the railroad station and roundhouse. Spurs serve Quays Nos. 1, 2, and 3 (References ⑱⑲⑳㉑㉒).

Roads. Macadamized roads parallel the railroad routes connecting Ch'ongjin with Nanam and Susong. Streets serve all the landing facilities in Commercial Harbor and provide clear-

TABLE VI - 6
WAREHOUSING FACILITIES AT CH'ONGJIN COMMERCIAL HARBOR

REFERENCE ON FIGURE VI - 10 AND LOCATION	NO.	WIDTH (FT.)	LENGTH (FT.)	GROUND AREA (SQ. FT.)	REMARKS
㉑ Fronting Quay No. 2, N side of harbor	3	100	264	26,400	Road and RR spur
㉑ Inland of Quay No. 2	1	70	158	11,060	RR spurs on landward and seaward sides. Road
㉒ Fronting Quay No. 1	1	100	150	15,000	Road and RR spur
㉒ Fronting Quay No. 1	1	100	264	26,400	Do.
㉒ Inland of Quay No. 1	1	100	150	15,000	Do.
㉓ On Coastal Trading Mole	1	65	280	36,400	Roadway along pier connects with road paralleling quays around harbor
㉓ On Coastal Trading Mole	1	65	215	32,175	Do.
㉓ Landwards of Coastal Trading Mole	6	50	60	3,000	Accessible by road along harbor front
㉔ South quayed portion of small vessels harbor, just inland of S breakwater	1	85	215	18,275	Do.
Total estimation of known warehousing at Commercial Harbor	16			215,000	

ance for those facilities which do not have railroad connections. Streets and road connections are available for virtually all the landing facilities in Industrial Harbors A and B. Streets linked with the main highway serve the quays in Industrial Harbor B which do not have railroad connections. The main highway to Nanam runs west-southwestward from Ch'ongjin a short distance northward of the railroad line that serves Industrial Harbors A and B. This road also crosses bridges over the canal and river. Northward of the Japan Iron Works, the road turns to the southward.

(5) Supplies.

(a) Coal. Coal is plentiful; several mines near Ch'ongjin are easily accessible by road and railroad. Formerly, there was a large coal depot south of the railroad station, but with the reclamation and improvement of the shoreline westward of the tracks, the coal depot has been moved to an undetermined location, possibly Industrial Harbor A, where aerial photographs show large stores of what seems to be coal.

(b) Oil and gasoline. A 1941 report listed fuel oil storage capacity as more than 500,000 tons. Location of storage tanks is undetermined, but oil stores have been identified on Reference ⑦ in Industrial Harbor A.

(c) Water. The city waterworks insures adequate supply. Quay No. 1 (Reference ㉒) has 3 hydrants: 1 solid feed-water pipe and 2 feed-water hoses. In addition there are one 30-ton and one 20-ton water barges with pumping apparatus, and one motor boat, also equipped with pumps. The water barges can supply 50 cubic meters in 10 hours, and the motor boat can supply 200 cubic meters in the same length of time.

(d) Electricity. Ch'ongjin draws its electric power from hydroelectric plants that serve the general area. There is also a 16,000 kilowatt steam plant at one of the industries.

(6) Repair facilities.

In 1930 three yards and 2 iron works capable of repairing damage only to motor boats were reported. No repair docking facilities existed at that time. Aerial coverage discloses a marine railway (Reference ㉘) on the western shore of the Komalsandan, but data on the installations ashore are lacking.

D. Songjin (Jōshin).

(40°40'N, 129°13'E)

Songjin (Jōshin), a major fishing center now being developed as an industrial port, is on the northeast coast of Korea, 118 miles southwest of Najin (PLAN 6). Two industries, one believed to be a magnesium plant and the other a steel plant, are at the port. Exports include lumber, crude magnesite ore, and magnesia.

The bay harbor is easily accessible and clear of hazards, but has general depths of 20 to 30 fathoms and is exposed to the southward. The harbor is not obstructed by ice. A breakwater gives partial protection to North Harbor, which includes a 1,400-foot new Main Wharf with 30 to 45 feet of water alongside, a lumber quay, and 2 basins—one for small craft and the other for timber storage. Northward of North Harbor, near the reported magnesium plant, is a lighter basin, apparently used in connection with the plant. Southward of North Harbor is an artificially protected Fishing Harbor with quayed inner shores for mooring small vessels.

North Harbor has 4 first-, 5 second-, and 3 third-class anchorage berths, and unlimited *temporary* anchorage is available in the exposed bay. Nearby rivers freeze in winter, but the harbor area is neither ice-bound nor obstructed by ice. The Main Wharf can berth three 450-foot ships and is estimated to have a daily unloading capacity of 1,800 long tons. The remainder of the landing facilities at the port are for lighters and small craft. It is estimated that 5,000 long tons can be discharged from approximately 10 Libertys in the stream, giving the port an estimated 6,800 long-ton daily unloading capacity.

(1) Harbor.

Songjin is on the west shore of Immyong-ch'on (Rimmeisen). This large easily accessible bay is entirely clear of navigational hazards; however, its excessive depths and southward exposure make it suitable for temporary anchorage only (FIGURE VI - 14).

Occupying 2 bights on either side of a small hilly finger of land called Songjin peninsula, the port consists of a north commercial harbor and a south fishing harbor. A 448-yard breakwater extends northeastward from the end of the peninsula to give partial protection to the North Harbor. North Harbor has a small inner basin for small craft, and a small enclosed timber storage basin.

Near the large magnesium plant, northward of North Harbor is a lighter basin.

Enclosed in a basin protected by a 275-yard breakwater and a small training wall, the Fishing Harbor has quayed inner shores suitable for mooring small vessels.

(a) Anchorage. Available anchorage in North Harbor consists of 4 first-, 5 second-, and 5 third-class berths, with depths ranging up to 60 feet over a sandy bottom. In addition, almost unlimited temporary anchorage is available throughout the head of Immyong-ch'on.

(b) Local weather. In April and May, strong winds blow from the south and south-southeast. Fog comes up from seaward in the morning, and disperses in the afternoon, but data on prevalence are not available. Frequently, however, its duration is about 48 hours. Snow falls on an average of about 40 days in a year. Its maximum depth is less than 2 feet. Snow is usually accompanied by north or northwest wind. Nearby rivers always freeze in winter, but the harbor is neither ice-bound nor obstructed by ice.

(c) Significant hydrographic features. The mean high water interval is 2 hours, 55 minutes; springs and neaps both rise almost 1 foot. Information on tidal currents is not available, but it is believed that the effect of currents is negligible.

(2) Landing facilities.

A program of harbor construction has been and presumably still is in progress at Songjin.

Harbor craft include: 46 lighters of from 20 to 60 tons; 4 motor tugs with a total tonnage of about 65 tons; 6 shore boats; and a water boat with a capacity of 4 or 5 tons.

(a) North Harbor. The Main Wharf (Reference ⑩), on the north side of Songjin peninsula, has been under construction in recent years and is now nearing completion. A small amount of filling remains to be done and, east of the wharf, a breakwater, now about 445 yards long, is still being

extended. Although a road is laid across the reclaimed area behind the wharf, no buildings or other improvements have been added as yet. However, it is assumed that the wharf is at present usable although perhaps not to its planned capacity.

Main Wharf (Reference ⑩); details follow:

Location:	N side of Songjin peninsula.
Purpose:	Designed to become main deep water terminal of the port.
Construction:	Solid earth fill behind concrete bulkhead.
Length:	1,400′.
Depth alongside:	30′ to 45′.
Berthage:	Probably three 450-foot vessels.
Unloading capacity:	1,800 long tons per day.
Remarks:	A road at present used for transporting fill material is the only exit. Width of the reclaimed area behind the wharf being 150 yards, there is ample room for open storage. Clearance somewhat obstructed by hill at base of peninsula. W of the wharf to the S breakwater of the Small Craft Basin the shore line is bulkheaded and presumably usable for mooring small craft.

Timber Quay (Reference ⑦); details follow:

Location:	S of Hanch'on-ch'on.
Purpose:	Possible handling of lumber.
Construction:	Stone with sloping face.
Length:	1,800′.
Depth alongside:	3′ for 1,000 ft.; 8′ for 800 ft.
Berthage:	Lighters only.
RR:	Several sidings.
Remarks:	Aerial coverage showed quay may be unsuitable for lighter servicing and that this area is served by the small boat landing to the S. Open area behind quay used for lumber storage (Reference ⑥).

Small Craft Basin. This 55,000 square yard basin, enclosed by 2 curved breakwaters, has depths which nowhere exceed 12 feet. On the inner side of the basin is a quay (Reference ⑧), in 3 sections. A small customs pier (Reference ⑨) projects from the South Section of the quay. At the base of the north breakwater is a small boat landing pier.

Quay (Reference ⑧); details follow:

Location:	Inner side of Small Craft Basin.		
Purpose:	Small craft loading, unloading, and mooring.		
Construction:	Stone bulkhead with sloping face.		
	W Section	SW Section	S Section
Length:	500′	550′	400′
Depth alongside:	5′	8′	6′
Storage:	W Section: 2 buildings with total of 1,300 sq. yds. of floor space.		
	SW Section: 4 transit sheds each measuring 100′ by 35′.		
	S Section: Customs compound faces on quay; contains 2 buildings 100′ by 30′; one 75′ by 30′; also smaller buildings.		
RR and roads:	Surfaced road parallels the quay and connects with town street system; RR parallels quay 1 block inland.		

Customs Pier (Reference ⑨); details follow:

Location:	S side Small Craft Basin.		
Purpose:	Small craft loading, unloading, and mooring.		
Construction:	Wooden.		
	Face	E Side	W Side
Length:	35′	90′	90′
Depth of water:	7′	6′	7′
Berthage:	Small craft only.		
Cranage:	8-ton wooden shears believed to be on pier.		
RR and roads:	Track laid to end of pier connects with harbor belt line.		
Remarks:	Water line laid on pier has 2 hydrants with total capacity of 20 tons per hour.		

Timber Basin (Reference ⑤); details follow:

Location:	N side of North Harbor.
Purpose:	Handling and storage of logs and lumber.
Construction:	45,000 sq. yd. basin enclosed by 2 breakwaters. Inner quay of stone with sloping face. Inner Quay.
Length:	870′.
Depth:	4′ to 6′.
RR and roads:	2 sidings run at rear of quay.
Remarks:	Timber basin has depths of 4′ to 11′. Entrance between breakwaters is 85 yds. wide. Usable by small craft only.

(*b*) *Fishing Harbor* (Reference ⑪). The small craft Fishing Harbor on the south side of Songjin peninsula is protected by a breakwater but depths do not exceed 13 feet in the basin. The inner side of the basin has been reclaimed and divided into 2 sections. Each of these sections is faced with quays approximately 780 feet long. Depths along side range from 6 feet to 13 feet; both are used as mooring for fishing craft. Eleven buildings, presumably storage facilities, with a total floor space of 4,500 square yards, are adjacent to the north quay section; behind the south quay section are 20 buildings with a total area of 16,500 square yards.

(*c*) *Lighter Basin* (Reference ①); details follow:

Location:	Adjacent to magnesium plant (Reference ②), N of North Harbor.
Purpose:	Lighter basin serving magnesium plant.
Length:	1,100′ of quayage.
Berthage:	Lighters only.
RR:	Spur 140 yds. to the rear.
Remarks:	Consists of a narrow dredged slip with an extending jetty on S side.

(3) *Storage facilities.*

The 37 buildings mentioned under landing facilities have a total area of 24,500 square yards. In addition, there are 6 areas suitable for open storage, totaling 285,000 square yards in area.

Five of these areas (Reference ④), in the vicinity of the Timber Basin (Reference ⑤), have an approximate total area of 225,000 square yards. In December 1944, about 40% of this area was covered with lumber and logs. In this same location, there are 6 woodworking plants with a total area of 6,800 square yards.

The sixth area (Reference ⑥), back of the Timber Quay (Reference ⑦), has 60,000 square yards of open storage. Of this, 20,000 square yards were covered with logs in December 1944.

(4) *Capacity and clearance.*

(*a*) *Actual annual traffic.* Six hundred and forty-seven steamships of 587,430 tons and 5,297 sailing vessels of 330,647 tons entered Songjin in 1936.

(*b*) *Estimated unloading capacity.* The unloading capacity of the port for general cargo by ship's gear is estimated at 6,800 long tons per day, of which 1,800 long tons can be worked alongside the Main Wharf (Reference ⑩) and 5,000 long tons discharged from an estimated 10 Libertys in the stream. The roadstead is open to the south and weather from that quarter would interfere with loading operations in the stream.

(*c*) *Facilities for clearing port.* Songjin is on the main east coast railroad and road, both of which run northward to

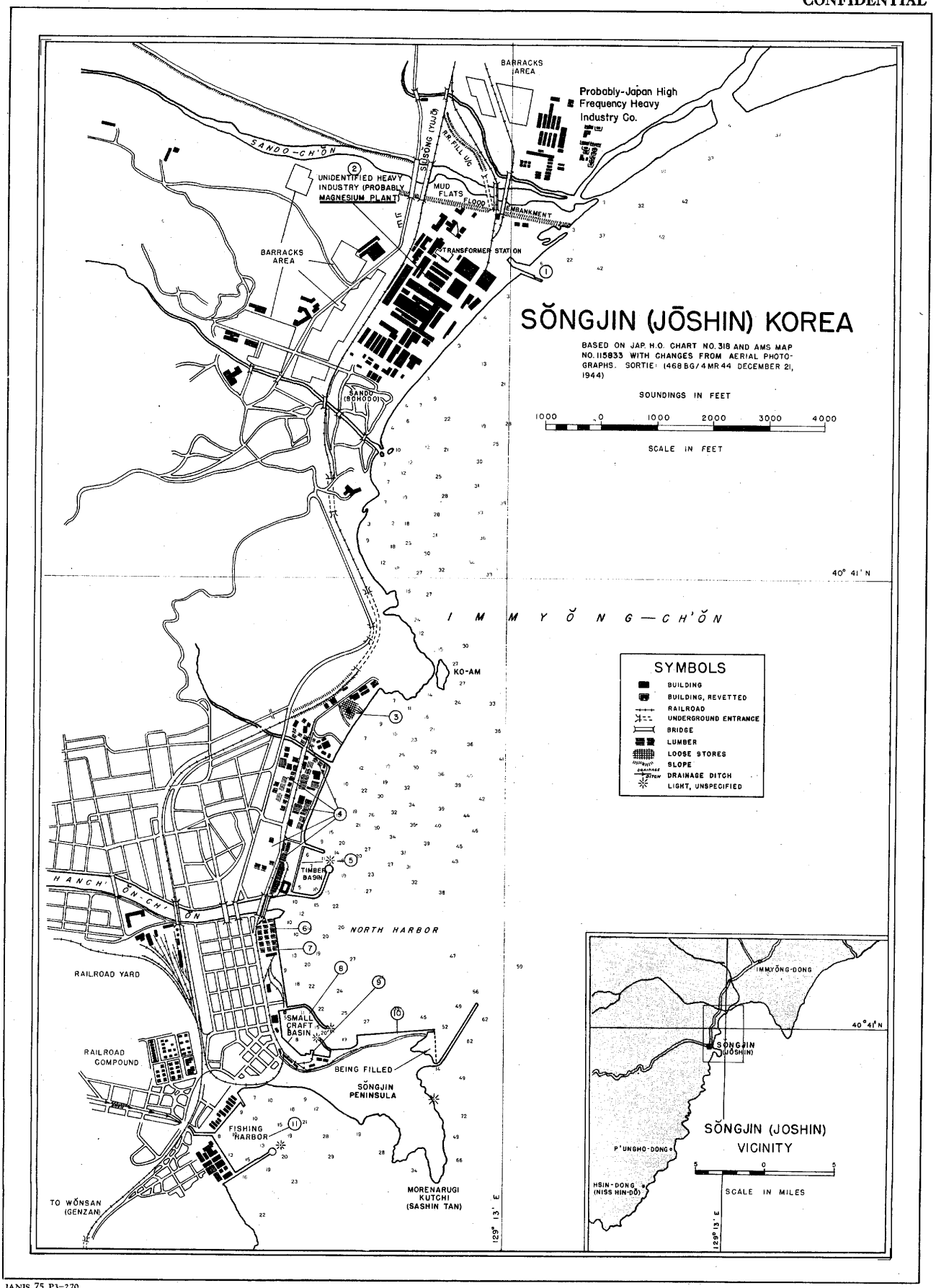

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FIGURE VI - 14. *Songjin.*
Port plan showing location of facilities by encircled reference numbers.

Ch'ongjin and the Manchurian border, and southward through Hungnam to Wonsan (Genzan).

Rail tracks run to, or within 200 yards of, all the landing facilities, and there appear to be good road exits from all the facilities, except the Lighter Basin (Reference ①), to streets which parallel the waterfront. The Lighter Basin (Reference ①), which is about 2½ miles north of the town, is backed by a large magnesium plant. Roads probably connect the various buildings of the plant with each other and with the Lighter Basin.

Two natural obstacles divide the landing facilities into 3 groups, and may cause transportation bottlenecks. The first obstacle is the Hanch'on-ch'on (river) which discharges close north of the Timber Quay (Reference ⑦) and divides the town waterfront into 2 parts. The Timber Basin (Reference ⑤) is the only landing facility on the town waterfront north of the river; the main facilities are to the south of the river. The river is about 200 feet wide and is crossed by 3 road and 3 rail bridges within the city; there are other road bridges further inland.

The second obstacle is the steep ridge which bounds the northern side of the town and terminates in Ko-am Island. The ridge rises at a slope of between 1 in 2 and 1 in 3 to a height of about 250 feet, and it separates the town from the industrial plants behind the Lighter Basin (Reference ①). The railroad passing through 2 tunnels, and a road passing through 1 tunnel cross the ridge within 300 yards of the coast. Another road makes a detour inland and crosses the ridge by winding along the contours of a side-valley.

(5) Supplies.

Water is brought by aqueduct into the town; its quality is good. Power is obtained from 4 plants 50 miles to the northwest. Stores of coal do not exist in Songjin; lignite is mined in the vicinity and used locally for steaming purposes, but is not suitable for ships' bunkers. There are said to be 2 oil dumps in Songjin, but location and capacity are not known.

(6) Repair facilities.

A repair yard for small boats (Reference ③) is at the north end of town. Four slipways which will accommodate 65-foot lighters cross the sandy beach at this point.

E. Hungnam (Kōnan).
(39°50'N, 127°37'E)

Hungnam (Kōnan) is on the east coast of Korea about 40 miles north of Wonsan (Genzan) (PLANS 9 and 36). The port has been developed in the last 12 years to import the raw materials and export the products of 4 large industrial plants on or near the waterfront. The largest of the plants belongs to the Chōsen Nitrogen Fertilizer Co., and covers an area of about 2,000 by 700 square yards immediately behind the main landing facilities; it produces fertilizers and light metals. The other plants are an explosives factory, about 1½ miles southwest of the main landing facilities, and a chemical plant and a new nitrogen plant, both about 2 miles inland from the landing facilities. Hungnam is one of the world's largest producers of ammonium sulphate, and in the Japanese Empire it is the largest producer of nitric acid, glycerine, sulphuric acid, and magnesium.

Hungnam has only 4 deep-draft landing facilities, but these can accommodate 11 vessels from 300 to 500 feet long, drawing 20 to 30 feet, and one 225-foot vessel drawing 16 feet. Dock No. 1, which provides the most berthage, is equipped for intensive cargo-handling; it has a large rail-track footage, four 10-ton traveling bridge cranes and one 40-ton crane. The other deep-draft landing facilities have no fixed cranes but are probably served by 3-ton cranes which travel on narrow-gauge tracks. Around the shores of Sohojin-man are 5 landing facilities with depths less than 10 feet.

The most serious limitation of the port is the small size of the harbor, which provides only 1 second- and 7 third-class anchorage berths. Vessels waiting to berth at the landing facilities often have to anchor in the roadstead which is exposed to the south, southeast, and southwest.

The shortage of protected anchorage makes Hungnam one of the few ports in Korea at which more cargo can be handled alongside landing facilities than in the stream. It is estimated that 8,000 long tons can be discharged per day alongside the landing facilities, and 7,500 long tons into lighters in the stream. In winter, only a thin surface of ice freezes in the harbor.

(1) Harbor.

The harbor at the head of Sohojin-hang is protected from the south-southwestward by a combination pier and breakwater (Reference ①)* with a total length of 5,110 feet (FIGURE VI - 15). The harbor area north of this combination pier and breakwater is approximately 402 acres with depths up to 32 feet.

Recent harbor improvements include:

An area of approximately 65 acres, in the northern part of the harbor, is in the process of reclamation. Upon completion, it will provide about 2,800 feet of additional wharfage—not counting wharfage available at Dock No. 4 (Reference ④); already in use.

An area of approximately 75 acres, contiguous to the area being reclaimed, is being dredged to greater depths and will probably be completed with the reclamation project.

A triangular piece of land, 2,600 feet by 700 feet, has been reclaimed along a line from the middle of the southwest side of Dock No. 1 (Reference ①) southwest to the small boat harbor.

One thousand seven hundred fifty feet has been added to the breakwater connected to Dock No. 1, (Reference ①) giving the breakwater an overall length of 2,850 feet.

(a) Entrance channel. The entrance channel between the end of the breakwater and Taejin-do is approximately 1,000 yards wide. A channel dredged to 32 feet leads in a north-northwesterly direction along the breakwater to the pier and wharves where the bottom has been dredged to depths ranging from 18 to 30 feet.

From the east entrance of the bay at Oeyangdo-dan (Gaiyōtō-tan), (Panyansomu Kutchi) to the harbor entrance, navigation presents no difficulty.

(b) Anchorages. Within the harbor, there are 1 second- and 7 third-class anchorage berths. Anchorage outside the harbor is not considered good, due to the wide exposure of Sohojin-hang to the south, southeast, and southwest. However, it is believed that most of the vessels unable to come alongside

* References are encircled numbers on FIGURE VI - 15.

when the landing facilities are crowded anchor in the roadstead because of the small space available in the harbor.

(*c*) *Significant hydrographic features.* The mean high water interval in Sohojin-hang is 2 hours, 45 minutes; neaps rise 0.98 of a foot, springs rise 0.98 of a foot; the mean level above datum is 0.65 of a foot.

(*d*) *Local weather.* The rainy season is from July to September. In winter the rainfall is slight, but there is some snowfall. A west wind is prevalent throughout most of the year, but it blows from the east in summer. When a rare southeast wind blows, anchorage in the roadstead is difficult for ocean-going vessels. In winter, only a thin surface of ice freezes in the harbor. Fog occasionally occurs in summer, and becomes thick enough to prevent vessels from entering the harbor about twice a year.

(*2*) ***Landing facilities.***

The deep-draft general cargo facilities (FIGURE VI - 16) can berth 12 vessels in depths of 16 to 30 feet; TABLE VI - 7 gives the distribution of vessel berths at the general cargo facilities, Docks Nos. 1, 2, 3, and 4 (References ① through ④).

TABLE VI - 7

DISTRIBUTION OF VESSEL BERTHS AT HUNGNAM

BERTHS AVAILABLE	VESSEL LENGTHS (FT.)	ALLOWABLE DRAFTS (FT.)	REFERENCE NOS. ON FIGURE VI - 15
1	500	30	①
2	500	26½	①
1	385	25	③
2	360	22	③
2	300	18 to 20	②
3	300	20	④
1	225	16	①
12			

An additional 2,800 feet of wharfage will become available when improvements eastward and northward of Dock No. 4 (Reference ④) are completed.

The miscellaneous small-craft landing facilities in the harbor include a mole, a fishing harbor, 2 jetties, and 2 boat basins. In addition to boat harbors, approximately 4,150 feet of quay-age for small boats are available.

In 1932, there were 12 lighters totaling 242 tons and 11 motor tugs totaling 19 tons in the harbor.

The mechanical handling facilities in the harbor are concentrated on Dock No. 1 (Reference ①).

(*a*) *General cargo facilities.* Dock No. 1 (Reference ①) (FIGURES VI - 17, VI - 18, and VI - 19) is the largest pier in Korea.

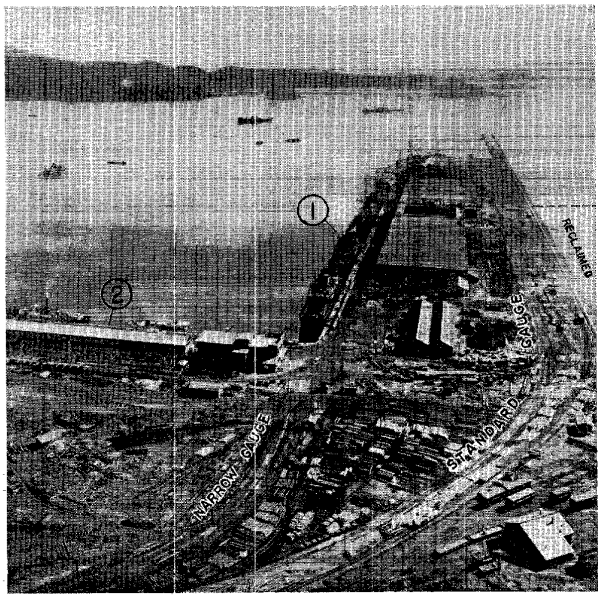

FIGURE VI - 17. *Hungnam.*
Docks Nos. 1 and 2 (References ①②), looking east-southeastward. Breakwater has been extended at end of Dock No. 1 and warehouse has been added.

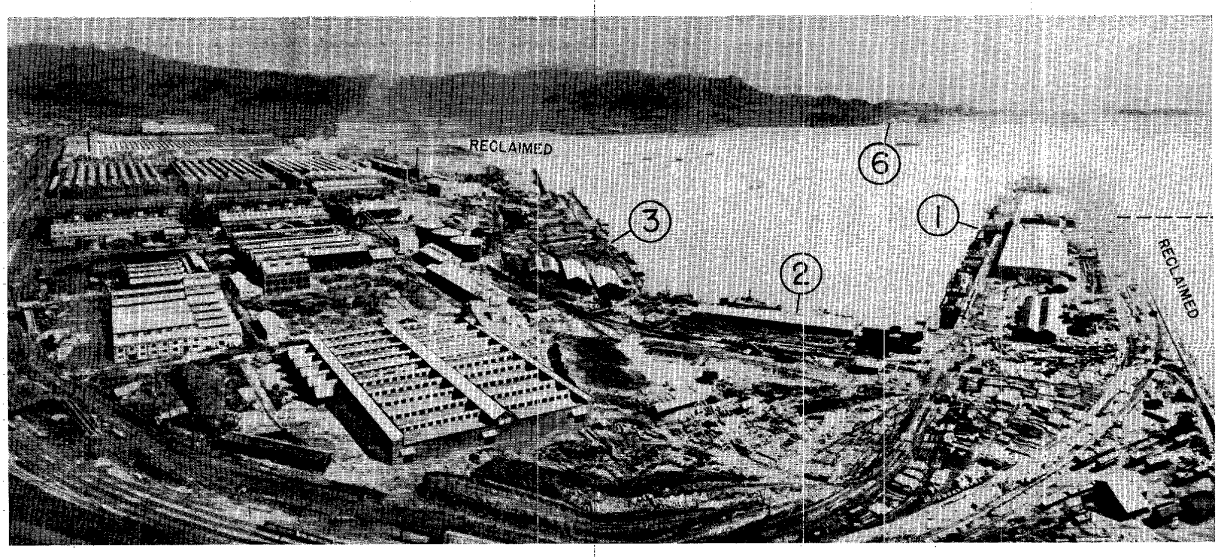

FIGURE VI - 16. *Hungnam.*
View of harbor, looking east-southeastward. About 1935. Breakwater has been extended at end of Dock No. 1 (Reference ①) and warehouse has been added.

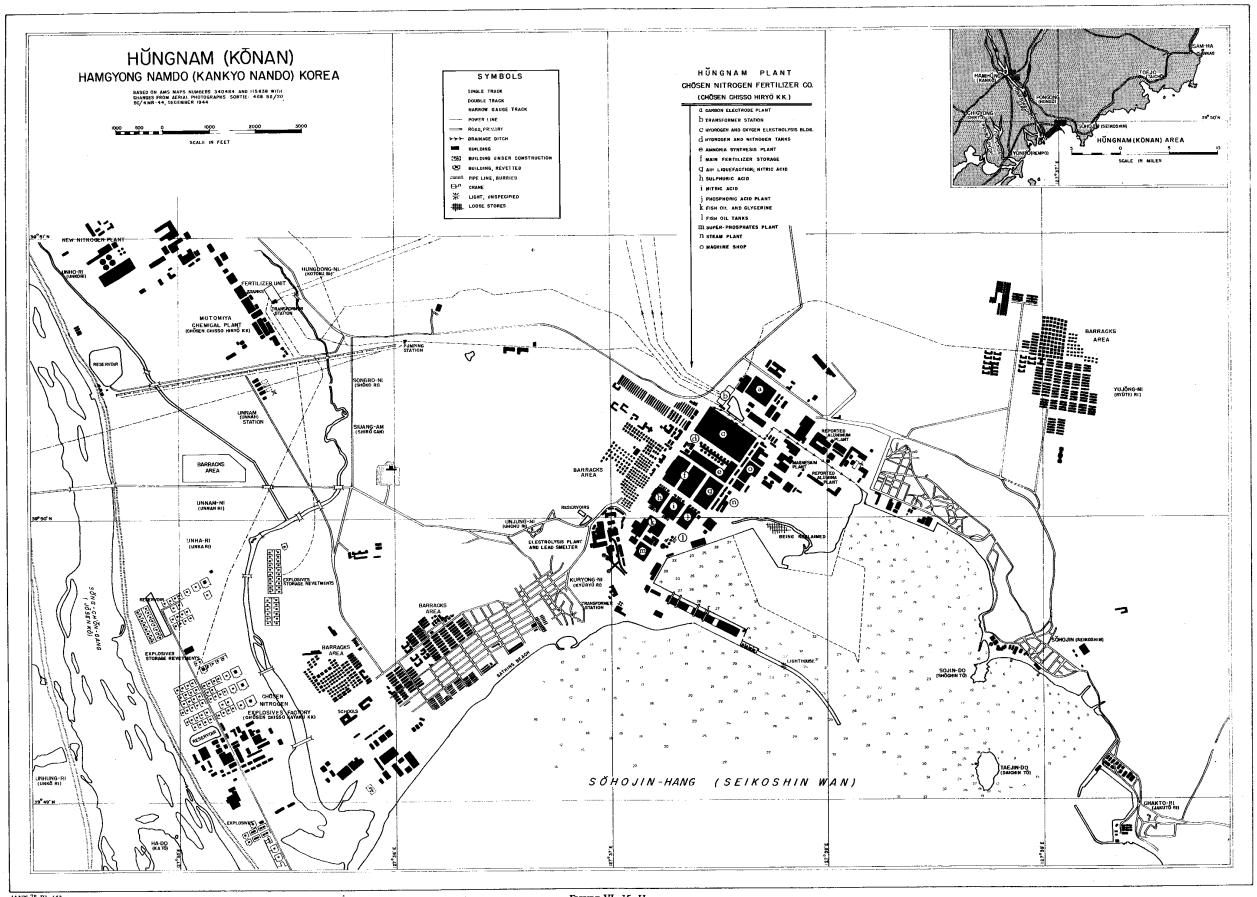

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FIGURE VI-15. *Hungnam.*
Port plan showing location of facilities by encircled reference numbers.

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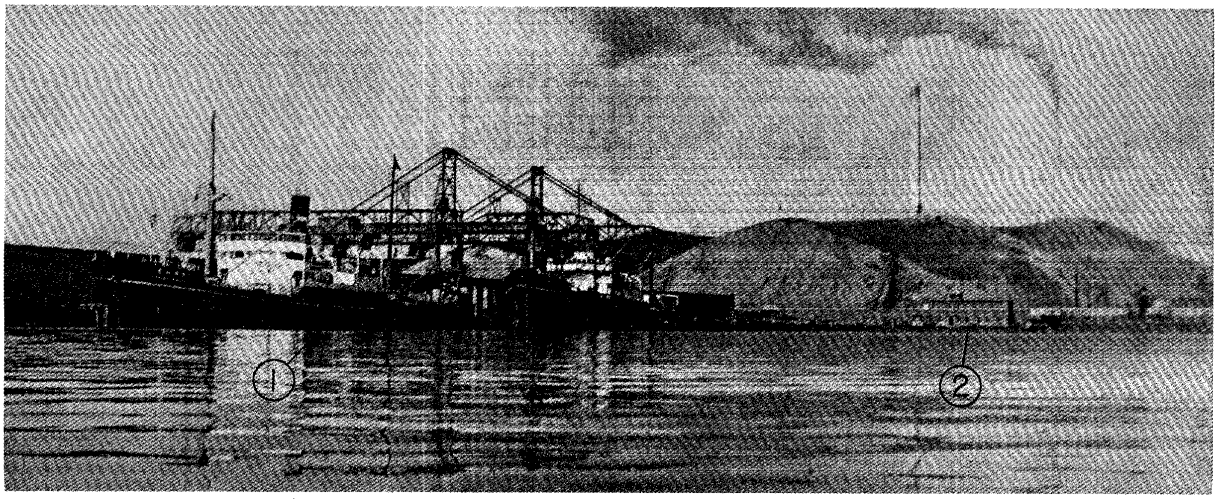


FIGURE VI - 18. *Hungnam.*
Cranes on Dock No. 1 (Reference ①), looking west-northwestward, about 1935.

FIGURE VI - 19. *Hungnam.*
Cranes and tracks on Dock No. 1 (Reference ①), looking eastward. About 1935.

No. 1 Dock (Reference ①); details follow:

Location:	SSW side of harbor.	
Purpose:	Handling supplies and products for Chōsen Nitrogen Fertilizer Co.	
Construction:	Earth fill type; reinforced concrete and iron sheet piling. Mooring bollards at 65-foot intervals.	
	Face	NE Side
Length:	260′	2,260′
Depth alongside:	19′ to 31′	18′ to 30′
Berthage:	One 1,200-ton freighter drawing 16′.	Three 10,000-ton freighters drawing 26′ to 30′.
Width of apron:	170′	45′
Capacity (lbs. per sq. ft.):	Unlimited.	
Storage:	Three 490′ by 150′ concrete transit-sheds connected to cover a 255,000 sq. ft. area. 2 loading wells between sheds are 110′ long. The roof of the inner shed may be rolled back to facilitate loading and unloading. 7 smaller sheds covering 76,000 sq. ft. Four 46′ diameter oil tanks at base of breakwater.	
Cranage:	One 40-ton crane at E corner of pier. Four 10-ton traveling bridge-cranes cantelevering 75′ over NE side of pier and shipping; overall length of each is 252′. Cranes unload into hoppers. Seven 3-ton cranes reported. These are probably mounted on RR cars and jointly serve Docks Nos. 1, 2, and 3.	
RR:	Extensive narrow-gauge RR system on pier serves transit sheds. Additional standard gauge lines enter area from N and W joining at a point opposite middle of transit sheds. Concentrated network is noted opposite westernmost transit shed. At least 10 tracks parallel each other at this point. Steam, gasoline, and electric locomotives. Possible engine-shed and RR repair shop.	
Water:	6″ and 3″ water mains on dock. Six 3″ hydrants, each capable of supplying 30 tons of water per hour.	
Unloading:	3,600 long tons per day.	
Remarks:	Small transformer station on newly reclaimed area. Pier is lighted.	

No. 2 Dock (Reference ②); details follow:

Location:	W side of harbor.
Purpose:	Handling supplies and products for Chōsen Nitrogen Fertilizer Co.
Construction:	Earth fill type quay; iron sheet piling.
Length:	620′
Depth alongside:	18′ to 20′
Berthage:	Two 3,000-ton vessels drawing 18′ to 20′.
Width of apron:	35′.
Capacity (lbs. per sq. ft.):	Unlimited.
Storage:	1 shed along quay covers 30,000 sq. ft. area.
Cranage:	Probably served by traveling cranes mounted on RR cars.
RR:	Narrow-gauge spurs parallel both sides of shed.
Unloading capacity:	800 long tons per day.
Remarks:	Lighted.

No. 3 Dock (Reference ③); details follow:

Location:	NW side of harbor.
Purpose:	Handling supplies and products for Chōsen Nitrogen Fertilizer Co.

Construction:	Earth fill type quay; iron sheet piling.
Length:	2,000′.
Depth alongside:	22′ to 26′.
Berthage:	Two 4,000-ton vessels drawing 22′ and one 5,000-ton vessel drawing 25′.
Width of apron:	30′.
Capacity (lbs. per sq. ft.):	Unlimited.
Storage:	2 sheds along quay covering a total area of 52,000 sq. ft.
Cranage:	Probably served by traveling cranes mounted on RR cars.
RR:	Narrow-gauge spurs parallel both sides of sheds.
Unloading capacity:	2,400 long tons per day.
Remarks:	Lighted.

No. 4 Dock (Reference ④); details follow:

Location:	W side of harbor.
Construction:	Rock or cement wall retaining earth fill.
Length:	1,000′.
Depth alongside:	12′ to 15′ previously. Has since been dredged to probable depths of 22′ or more.
Berthage:	It is believed that depths are sufficient to accommodate three 2,600-ton vessels drawing 20′.
Capacity (lbs. per sq. ft.):	Unlimited.
RR:	RR probably under construction on this quay.
Unloading capacity:	1,200 long tons per day.
Remarks:	It is believed that the bottom has been dredged to depths sufficient to accommodate medium-sized vessels. However, aerial photographs showed only lighters alongside. A shed or a wharf covering a 75′ by 140′ area is under construction on the quay wall of dock.

(*b*) *Miscellaneous small-craft landing facilities.* These facilities can be used for unloading by lighter and are estimated to have a total unloading capacity of 7,500 long tons per day.

T'aesong Company Mole (Reference ⑤); details follow:

Location:	N side of harbor at village of Sinsang-ni.
Owned and operated by:	T'aesong Co.
Construction:	Earth fill mole.
	Face — E side
Length:	1,600′ — 150′
Depth of water:	7′ to 9′ previously. May have been dredged to greater depths.
Capacity (lbs. per sq. ft.):	Unlimited.
Storage:	6 small storage sheds, near unloading boom cover 10,000 sq. ft. area.
Cranage:	2 unloading booms on W end.
RR and roads:	1,500′ from Hamgyong Main Line. Road connection.
Remarks:	1 small landing pier 30′ by 10′ extends from face. Unidentified industry occupies fenced-in area 270′ by 300′ in approximate center of mole. Steam Plant. Unidentified group of 15 buildings occupied fenced-in area 160′ by 500′ at E end of mole.

Fishing Harbor (Reference ⑧); details follow:

Location:	E side of harbor at village of Chakto-ri.
Purpose:	Fishing harbor.
Dimensions:	Formed by 2 breakwaters. N breakwater 800′ long and 100′ wide at base, narrows to 60′ width in last 250′. S breakwater 1,300′ long and about 50′ wide. Greatest N-S length, 1,600′. Greatest E-W width, 1,200′.
Depth of water:	1′ to 13′ previously. However, it is believed that the shallow parts have been recently dredged.
Berthage:	About 2,700′ of quayage available to fishing vessels.
Storage:	Estimated 50,000 sq. ft. of storage in 10 sheds near waterfront. 20 other buildings in vicinity of waterfront contain an additional 70,000 sq. ft. of possible storage space.
RR and roads:	Possible spur to Hamgyong Main Line 200 yards N of Chakto-ri. Road connection.

Sohojin Jetties (Reference ⑦); details follow:

Location:	NE side of harbor at village of Sohojin.
Purpose:	Berths for small boats.
Dimensions:	Two 110′ jetties.
Depth alongside:	3′ to 7′.
Storage:	12 or more sheds covering approximately 65,000 sq. ft.
RR and roads:	Narrow-gauge spur from Hamgyong Main Line to Jetties. Road connections.

Boat Basin (Reference ⑥); details follow:

Location:	NE side of harbor at village of Sohojin.
Purpose:	Harbor for small boats.
Dimensions:	Formed by 250′ breakwater extending S on W side of reclaimed land between Sohojin and Sojin-do. Length and width at extreme points—410′ by 190′.
Depth of water:	3′ to 7′.
Berthage:	Possible 200-ft. unloading-wall.
Roads:	Road to Hungnam just E of basin.

Boat Basin; details follow:

Location:	SW of Dock No. 1, outside harbor.
Purpose:	Small boat harbor.
Dimensions:	Formed by rocky point on NE extending 150′ and 180′ breakwater on SW. Underwater structures indicate possible construction of breakwater continuing 50′ beyond rocky point.
Depth of water:	4′ to 7′.
RR:	Located on the Hungnam Railroad Line which runs between Hungnam and Hamhung via the village Kuryong-ni.

(3) *Storage facilities.*

TABLE VI - 8 lists known storage facilities totaling approximately 608,000 square feet of covered area on or in the immedite vicinity of the landing facilities. Other storage facilities are near plants. The 3 warehouses on Dock No. 1 are each about 150 feet by 490 feet.

TABLE VI - 8
WAREHOUSES AT HUNGNAM

LOCATION AND REFERENCE NO. ON FIGURE VI - 15	NO. OF WAREHOUSES	TOTAL AREA IN SQ. FT.	REMARKS
① Dock No. 1	3	255,000	Area includes loading wells. RR on each side.
	7	76,000	RR
② Dock No. 2	1	30,000	RR
③ Dock No. 3	2	52,000	RR
⑤ T'aesong Co. Mole	6	10,000	
⑦ Jetties	12 or more	65,000	RR
⑧ Fishing Harbor	30	120,000	
Total	61	608,000	

(4) *Capacity and clearance.*

(*a*) *Estimated unloading capacity.* The estimated unloading capacity is 15,500 long tons per day, of which 8,000 long tons are discharged alongside the landing facilities and 7,500 long tons are worked by 15 Liberty ships anchored in the exposed roadstead.

(*b*) *Facilities for clearing port. Rail.* Hungnam is on the main east coast rail line which runs northward through Songjin to the Manchurian border and southward through the nearby city of Hamhung (7 miles inland) to Wonsan (Genzan). Hungnam is also connected to Hamhung by a light, standard-gauge railroad.

The main rail line runs through the northeastern edge of Hungnam to the main railroad station. The light railroad runs to the southwestern edge of Hungnam. A small system of narrow-gauge tracks connects the chief landing facilities with the nitrogen fertilizer plant.

Dock No. 1 (Reference ①), which projects from the center of Hungnam, is covered by a network of standard- and narrow-gauge tracks. The standard-gauge tracks connect with the main line to the northeast and 2 tracks connect with the light railway to the southwest. The narrow-gauge tracks run along the northern side of Dock No. 1 (Reference ①)—the side used for berthing.

Narrow-gauge tracks provide the only rail connections to Dock Nos. 2 and 3 (References ②③). A short, narrow-gauge spur connects the Sohojin jetties (Reference ⑦) with the main line.

Narrow-gauge tracks run close alongside the main line branch to Dock No. 1 for about 1,000 yards; they also run near standard-gauge tracks for a short stretch in the fertilizer plant. Transshipment from narrow- to standard-gauge tracks should not be difficult.

Road. A short main highway connects Hungnam with Hamhung where it joins the main highway running northward through Songjin and southward to Wonsan. Other roads lead northward along the coast for about 30 miles to Hongwon, and southward to the small town of Yonp'o. Road exits from all the landing facilities are probably available but rail tracks may be a hindrance (FIGURE VI - 17).

(5) Supplies.

(a) Water. Water is supplied to Dock No. 1 (Reference ①) by a 6-inch primary water main and a 3-inch secondary water main. Each of six 2-inch hydrants at the dock can supply 30 tons of water per hour. There is a water pumping station and reservoir on the Songch'on-gang west of Hungnam.

(b) Gasoline and oil. The Chōsen Nitrogen Fertilizer Company of Yongan produces synthetic gasoline and oil and supplies them to the fertilizer plant at Hungnam. A coal liquefaction plant was planned for Hungnam and it probably is in operation now. There are 4 oil storage tanks (each 46 feet in diameter) on the breakwater east of Dock No. 1 (Reference ①), with an estimated capacity of 30,000 barrels.

(c) Coal. Coal is available at the fertilizer plant and at the Marufuta Coal Yard (500 tons storage capacity) on the Sohojin Coastal Highway east of Hungnam. There is reported to be a coal mine approximately six miles west of the town.

(d) Electricity. Electric power is supplied to industry at Hungnam from the hydroelectric development projects 40 miles north on the Pujon-gang and Changjin-gang. There is a large steam plant at the Chōsen Nitrogen Fertilizer Company, on the water front, and a small steam plant at the base of Dock No. 1 (Reference ①).

(6) Repair facilities.

Hungnam has no extensive repair facilities. However, repair of derricks, etc., can be undertaken by the Fertilizer Company adjacent to the pier. At nearby Sohojin, on the northeast side of the bay, there is a ship-building yard and an iron foundry which are equipped for small-vessel construction and repair.

F. Wonsan (Genzan).
(39°10′N, 127°26′E)

Wonsan (Genzan) is on the east coast of Korea, at the southwestern corner of the large bay, Tongjoson-man, which narrows the Korean peninsula to a "neck" about 100 nautical miles across (PLANS 9 and 45). It has one of the best natural harbors in Korea, providing unlimited, sheltered anchorage, and is a regular port of call for ships from western Japan and northern Korea. The east coast terminus of the easiest rail- and road-route across the Korean peninsula is at Wonsan, and another cross-peninsula railroad joins the coastal line about 20 miles north of Wonsan.

Wonsan is the center of petroleum refining in Korea; the Chōsen Oil Refinery on the south side of the harbor is one of the largest in the Japanese Empire; the Rising Sun Petroleum Co. has installations about 5 miles northwest of Wonsan at Munp'yong-ni. Other industries are believed to be small. A naval air station is close east of the city, and the Japanese Navy uses the coal and oil stocks of Wonsan; there may be further naval development (Chapter XIII).

Three landing facilities can berth sea-going general-cargo vessels; they can accommodate 2 vessels in depths of 24 to 25 feet and 5 vessels in depths of 12 to 16 feet. Unlimited well protected anchorage over good holding-ground is available off Wonsan. Within the harbor administrative limit are 4 first-, 16 second-, and 30 third-class anchorage berths. The estimated total unloading capacity is 11,600 long tons per day, of which 1,600 tons is worked alongside at landing facilities, and 10,000 tons is worked into lighters in the stream.

Warehouses near the waterfront at Wonsan have a total area of 188,250 square feet. Oil storage tanks at and near Wonsan probably have a total capacity of about a million barrels.

Thin ice forms in the harbor area about 2 months a year, but does not interfere with navigation.

(1) Harbor.

Wonsan-hang, in the southwest part of Yonghung-man, is a well-sheltered natural harbor area protected by the mainland on the south and west and by Kalma-pando (peninsula) on the east (FIGURES VI - 20 and VI - 21). The area south of the harbor administrative limit line, shown on FIGURE VI - 21, is about 2,500 acres, and has general charted depths of from about 20 to over 35 feet.

Within the harbor area are 2 artificially protected harbors in which most of the landing facilities are concentrated. Main Harbor, the northern of the two, is protected on the north by a 3,280-foot breakwater. Fishing Harbor, the southern of the two, is protected on the north by a breakwater about 1,000 feet long.

The city fronts the harbor from the small beach area just northwest of Main Harbor to the Chōsen Oil Company Refinery. However, naval installations constructed since 1937 extend east and north along Kalma-pando (peninsula).

About 9 miles northward of Wonsan, on the northwest side of Yonghung-man, is the newly constructed Wonsan North Harbor which has some small, probably shallow-draft, landing facilities.

Waterway clearance up to 1,000 yards inland is provided by the Kujokchon-ch'on and the P'oha-ch'on Rivers.

(*a*) *Entrance channels.* Yonghung-man, whose southern end forms Wonsan harbor area, has a large number of islands and rocks in its entrance. Three main channels lead between the islands. The southern and best channel passes first between the islands of Umi-do and Yo-do, and then between Kalma-gak and Tae-do. The least depth in this entrance is 7 fathoms. Vessels should keep in the middle of the channel and round Kalma-gak at a distance of at least 1,000 yards.

The middle channel passes first between Yo-do and Ung-do and then between Sin-do and Mo-do. It has least depths of 11 fathoms. Vessels should pass well south of the rocks of Worhyon-am (Getsuken-gan, Orupyon Pao).

The northern channel, passing north of Ung-do and Mo-do, is encumbered by rocks and seems the least preferable entrance.

(*b*) *Anchorages.* Anchorage berths are unlimited. Within the harbor administrative limit line are 4 first-, 16 second- and 30 third-class anchorages. These well protected anchorage berths lie over good holding ground of largely mud bottom. They would leave clear an entrance channel 300 yards wide, the Main Harbor, the Fishing Harbor, and the areas close off the oil refinery.

Outside the harbor limit there is unlimited anchorage comprising approximately 40 square miles, in Yonghung-man, and in Songjon-man and Changjahwa-man (Chōjikan-wan, Changeh'igon-man), which open off it. The Japanese 5th and 6th fleets were here in either 1926 or 1927. Least depths are 30 feet and in 90% of the area depths range from 42 to 60 feet. Protection and holding ground throughout the area is good. A ½-mile-wide channel is not included in this estimate.

(*c*) *Significant hydrographic features.* Tidal currents within Wonsan harbor area are weak, and in Yonghung-man are not strong. Only when rounding Kalma-gak, upon entering Yonghung-man from the southern entrance, is swift water encountered. At Wonsan-hang and Kalma-gak the mean high water interval is 3 hours 00 minutes, and in Songjon-man 2 hours 50 minutes. In all 3 localities springs rise about 14 inches and neaps rise about 7 inches.

(*d*) *Local weather.* The lowest and highest recorded temperature at Wonsan, minus 7°F. and 103°F., have occurred in January and August. Some modifying influence is exerted on winter temperatures by the sea. Maximum rainfall is associated with the summer southeast monsoon between April and September.

Fog occurs on an average of 9 days per year. Maximum cloudiness is experienced during the summer rainy season.

Prevailing winds at Wonsan are west and southwest. The main exception is a pronounced sea-breeze (east through northeast) in the afternoon and early evening of the summer months. Migratory cyclones and anticyclones cause variable winds in winter. Foehn (Chinook) winds, most common in early spring and fall, blow down the eastern slopes of the mountains to the coastal regions, and are warm and dry.

Snow is possible from November to early April, never exceeding 2 feet; and ice formation in the harbor is prevalent during about two months of the year. The ice formations are generally thin and do not interfere with shipping, although small floes sometimes form.

(*2*) ***Landing facilities.***

Only 3 landing facilities at Wonsan can provide berths for sea-going, general-cargo vessels; the facilities on the Old Customs Wharf (Reference ③*), Pier No. 2 (Reference ⑥), and the Customs Wharf (Reference ⑧). These 3 facilities and the facilities for small general-cargo coasters (References ⑦ and ⑩) are all in the Main Harbor. TABLE VI - 9 lists the distribution of general-cargo vessel berths at Wonsan.

TABLE VI - 9
DISTRIBUTION OF GENERAL-CARGO VESSEL BERTHS AT WONSAN

TOTAL BERTHS	VESSEL LENGTHS (FT.)	ALLOWABLE DRAFTS (FT.)	REFERENCE NUMBER ON FIGURE VI - 21
1	365	24	⑧
1	420	25	⑧
1	225	15	③
2	225	12	③
2	225	16	⑥

Main Harbor also contains several miscellaneous landing facilities, which serve lighters, fishing vessels, and other small craft. Other miscellaneous landing facilities are in the Fishing Harbor.

East of the Fishing Harbor are 2 oil terminals (References ⑰⑱) which serve the Chōsen Oil Refinery. Another oil terminal (Reference ⑲) is at Munp'yong-ni about 5 miles northwest of Wonsan. Three coaling piers (Reference ⑪) in depths of 9 to 15 feet are at the east end of Main Harbor.

Wonsan North Harbor has some minor, probably shallow-draft landing facilities.

None of the terminals at Wonsan are well equipped with mechanical handling facilities. Storage facilities, particularly at the Customs Wharf and Quays (References ⑦⑧⑨), are well situated and adequately served by a harbor belt-line.

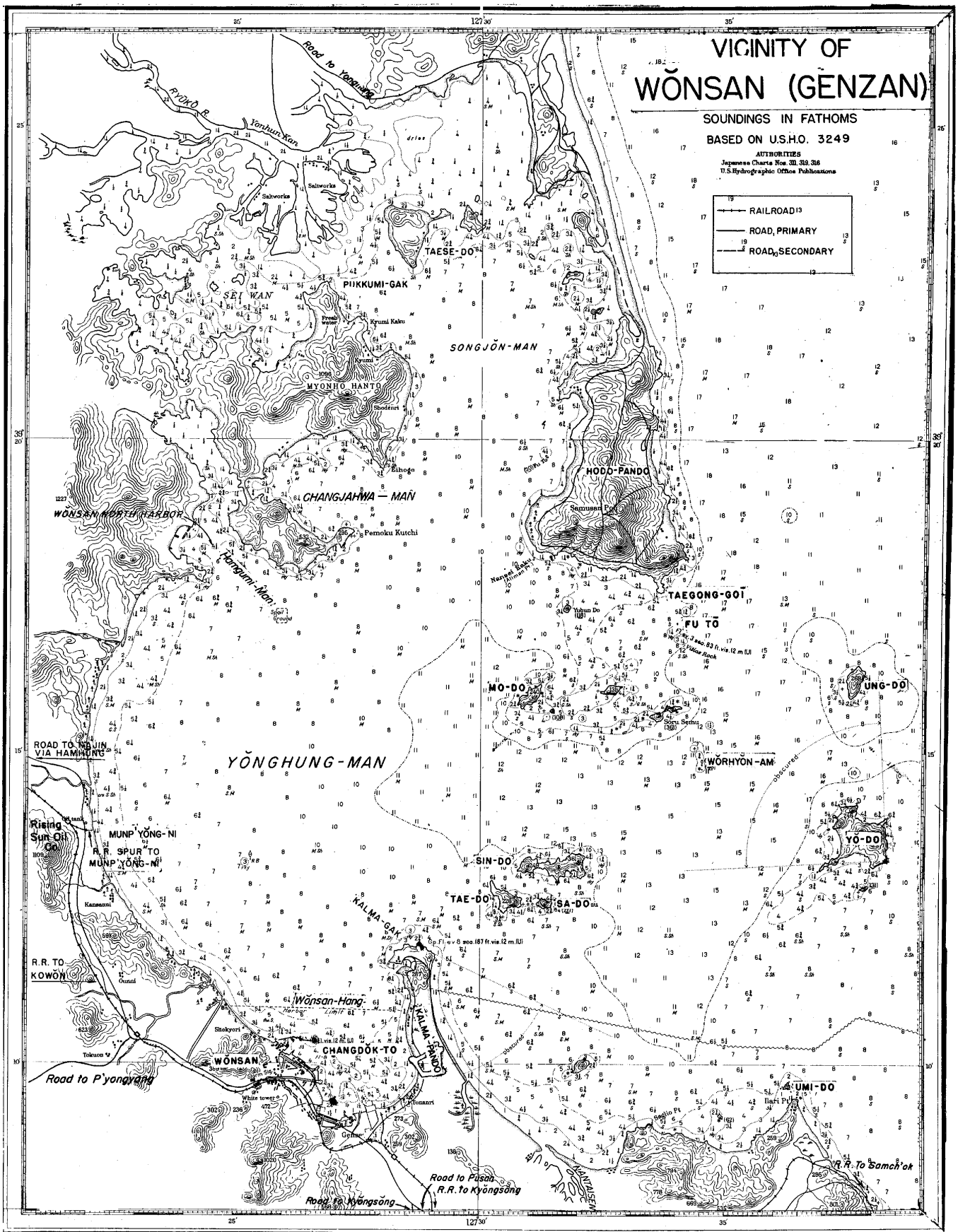
Although no data are available on the method of handling cargo at Wonsan, the port's small capacity for berthing vessels alongside makes it probable that considerable cargo is handled by lighter.

According to 1930 data there were 50 lighters, 3 tow-boats, and numerous fishing craft at Wonsan. Total tonnage of lighters, ranging from 40 to 60 tons, was 2,500 tons. Tow-boats consisted of one 7½-ton diesel, one 17-ton diesel, and one 28-ton steam craft. Thirty colliers of 35-ton capacity were reported in 1927. Although there are no tank lighters, lighters for packed oils are reported available.

Depths listed in following tabular descriptions of the landing facilities are from charts unless otherwise specified.

(*a*) *General-cargo terminals.* (FIGURES VI - 22 and VI - 23). All the general-cargo terminals at Wonsan are in the Main Harbor. They are the Customs Wharf (Reference ⑧), Customs Quays Nos. 1 (Reference ⑦) and 2 (Reference ⑩), the Old Customs Wharf (Reference ③), and Pier No. 2 (Reference ⑥). Only 3 of these terminals (References ③⑥⑧) are believed to provide berths for vessels of over 1,200 tons, and the Customs Wharf (Reference ⑧) is the only one of them capable of accommodating vessels between 4,000 and 6,000 tons. All of the general-cargo terminals are lighted by electricity.

* References are encircled numbers on Figure VI - 21.



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MUNP'YONG-NI FIGURE VI-20. *Wonsan.*

FIGURE VI-21
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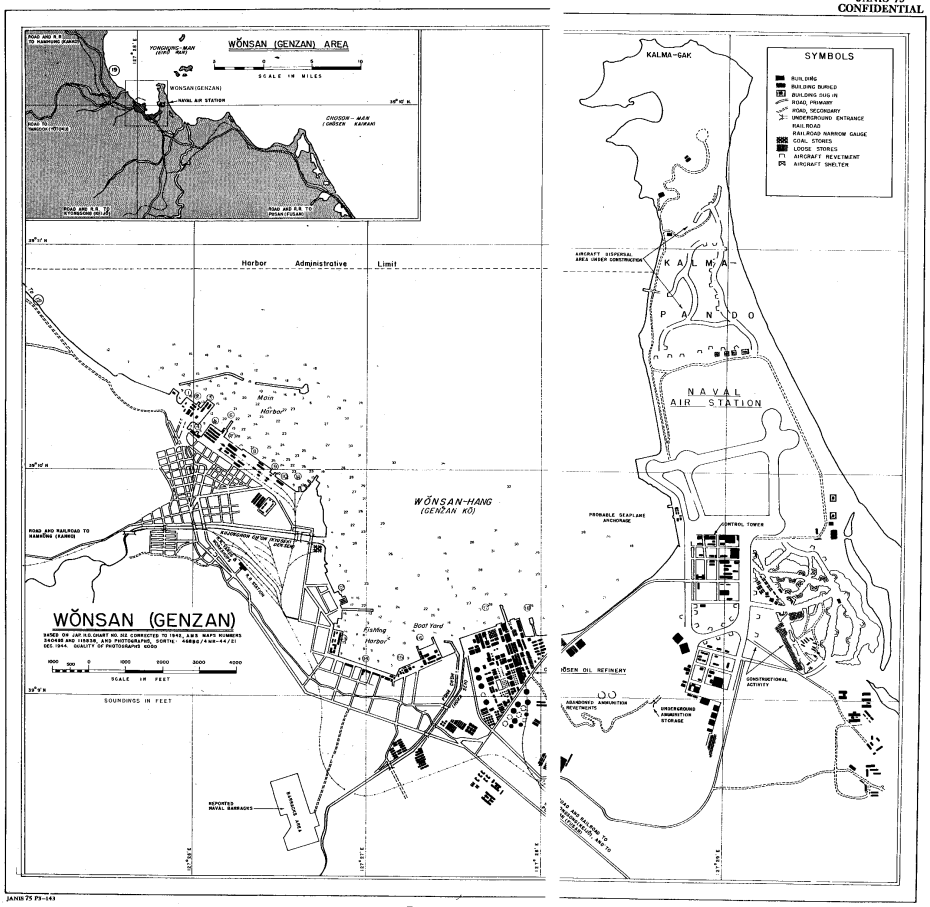

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FIGURE VI - 21. *Wonsan.*
Port plan showing location of facilities by principal use category.

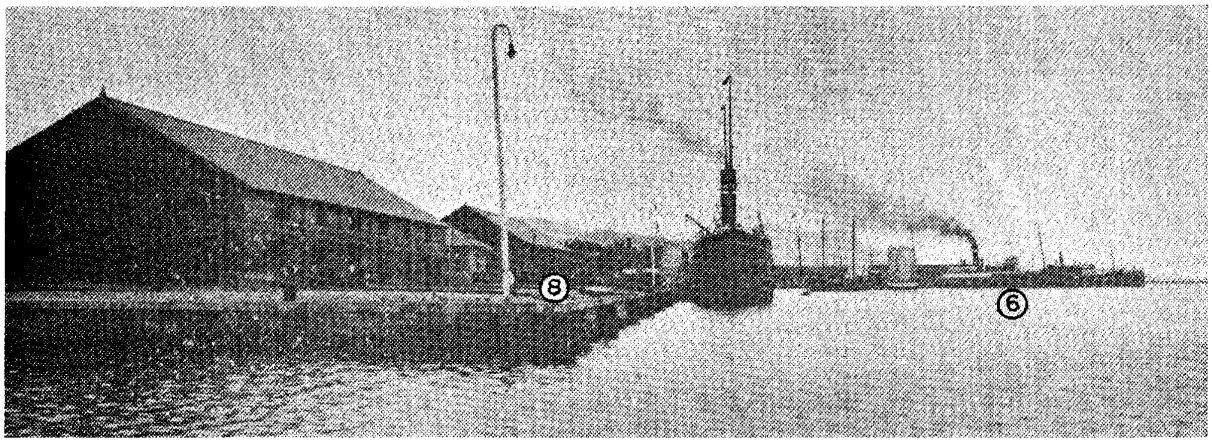

FIGURE VI - 22. *Wonsan.*
Customs Wharf (Reference ⑧) and Pier No. 2 (Reference ⑥), looking northwestward. Before 1930.

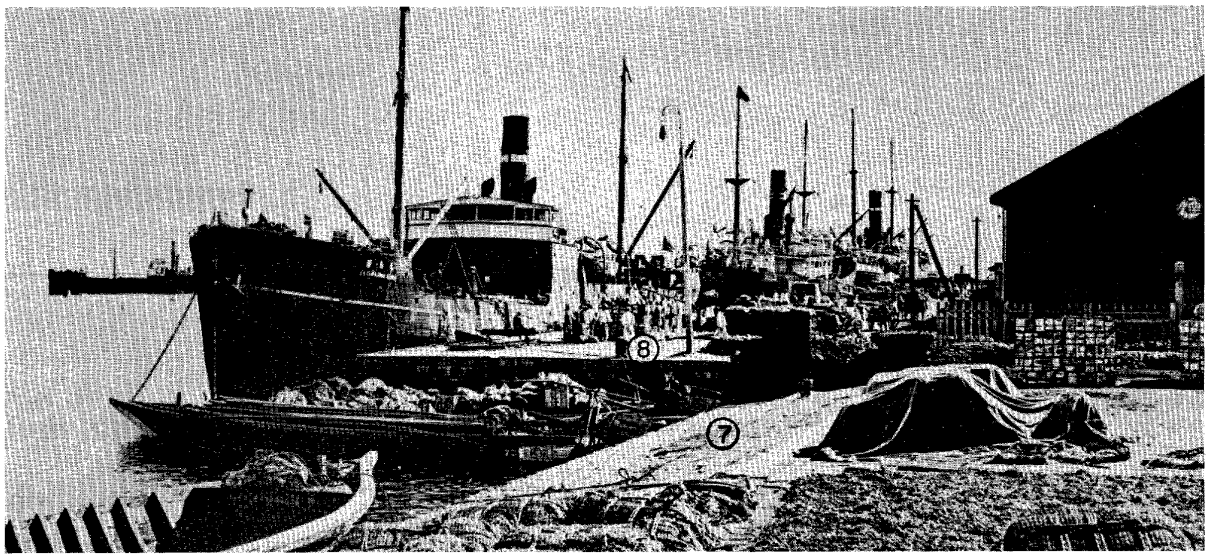

FIGURE VI - 23. *Wonsan.*
Customs Quay No. 1 (Reference ⑦) and Customs Wharf (Reference ⑧), looking southeastward. 1936.

Customs Wharf (Reference ⑧); details follow:

Location:	Center of Main Harbor.		
Purpose:	General trade.		
Construction:	Reinforced concrete, retaining solid fill.		
	Face	N side	S side
Length:	894′	30′	30′
Depths alongside:	24′ to 27′	No data	No data
Berthage:	One 4,000-ton vessel drawing 24′; and one 6,000-ton vessel drawing 25′.		
Capacity (lbs. per sq. ft.):	Probably unlimited.		
Storage:	8 warehouses: 1 approx. 60′ x 300′; 7 smaller.		
Cranage:	Probably one 42-ton traveling steam crane, serving also Customs Quays Nos. 1 and 2.		
RR and roads:	Tracks behind first warehouse and at rear of wharf. Road connections available.		
Unloading capacity:	1,200 long tons per day.		
Remarks:	Main landing facility of port. RR spurs connect with the mainline near the RR stations. 6 water-hydrants scattered throughout References ⑦⑧⑩.		

Customs Quay No. 1 (Reference ⑦); details follow:

Location:	NW side of Customs Wharf.
Purpose:	Marine products and general merchandise in coastal trade.
Construction:	Cut stone. Sloping face.
Length:	656′.
Depth alongside:	11′ to 24′ (Japanese source).
Berthage:	Small vessels.
Capacity (lbs. per sq. ft.):	Probably unlimited.
Storage facilities:	6 warehouses: 1 approx. 60′ by 350′; 1 approx. 60′ by 300′; and 4 smaller.
Cranage:	Probably one 42-ton traveling steam crane, serving also Customs Wharf and Customs Quay No. 2.
RR and roads:	RR spurs. Road connection available.

Customs Quay No. 2 (Reference ⑩); details follow:

Location:	SW side of Customs Wharf.
Purpose for which used:	Handling general merchandise in coastal trade.
Type of construction:	Cut stone. Sloping face.

Length:	Approx. 660'.
Depth of water:	8' to 16'.
Berthing space available:	Small vessels.
Capacity (lbs. per sq. ft.):	Probably unlimited.
Storage facilities:	One warehouse 60' by 100'.
Cranage:	One 42-ton traveling-steam crane, serving also Customs Wharf and Customs Quay No. 1; one 30-ton fixed electric crane reported at the mouth of the Kujokchon-ch'on to the S.
RR and roads:	RR Spurs. Road connection available.

Old Customs Wharf (Reference ③); details follow:

Purpose:	Marine products.		
	Face	N side	S side
Length (approx.):	240'	285'	695'
Depth alongside:	15'	12'	12'
Berthage:	Probably one 1,200-ton vessel drawing 15' at Face, and probably two 1,200-ton vessels drawing 12' at sides.		
Storage:	3 warehouses approx. 30' by 150'.		
Cranage:	One 3-ton stationary crane reported.		
RR and roads:	Road connections only.		

Pier No. 2 (Reference ⑥); details follow:

Location:	NW side of Customs Quay No. 1.		
Construction:	Reinforced concrete. Boarded surface.		
	Face	N side	S side
Length:	60'	298'	298'
Depth alongside:	11' to 20' (Japanese source).		
Berthage:	Two 1,200-ton vessels drawing 16'.		
RR and roads:	RR spurs close-by. Road connections probable.		
Capacity:	400 long tons per day.		
Remarks:	Maritime Affairs Office on bulkhead.		

(*b*) *Specialized-cargo terminals.* Three oil terminals are at or near Wonsan. The Oil Dock (Reference ⑰) and the Oil Pier (Reference ⑱) are both at the southeast end of the harbor area and serve the Chōsen Oil Refinery behind them. The Munp'yong-ni Oil Pier (Reference ⑲) is about 5 miles northwest of Wonsan on the western shore of Yonghung-man.

The other specialized-cargo terminals are 3 Coaling Piers (Reference ⑪) at the east end of Main Harbor.

Oil Dock (Reference ⑰); details follow:

Location:	SE end of harbor area.
Operated by:	Chōsen Oil Co.
Purpose:	To serve the Chōsen Oil Refinery.
Length:	Approx. 1,660'.
Depth:	15' alongside; 31' at face of pier jutting from wharf.
Storage:	12 oil-storage tanks 300 to 900 yds. inland (details listed in TABLE VI - 11).
RR and roads:	1 RR spur serves refinery. Road connections available.
Remarks:	Pier about 450' long, 85' wide, juts from E end of wharf. Pier is on piles and has pipe lines. Probably a pump house at end of pier.

Oil Pier (Reference ⑱); details follow:

Location:	E side of Oil Dock.
Operated by:	Probably Chōsen Oil Co.
Purpose:	To serve Chōsen Oil Refinery.
Length:	Approx. 480' (10' wide).
Depth alongside:	About 10'.
RR and roads:	1 RR spur serves refinery. Road connections available.
Remarks:	Float at end of pier is about 15' by 60'. Directly inland are 8 barrack-type buildings approx. 25' by 135'.

Munp'yong-ni Oil Pier (Reference ⑲); details follow:

Location:	About 5 mi. NW of Wonsan on W shore of Yonghung-man.
Operated by:	Believed to be Rising Sun Petroleum Co.
Construction:	Reported to be wood.
Length:	About 130' (6' wide).
Berthage:	Vessels, discharging through 8-inch floating pipeline 500' long, are limited only by draft: 28' for black-oil ships, 29' for white-oil ships.
Storage facilities:	11 oil-storage tanks (details listed in TABLE VI - 11).
RR and roads:	RR spur runs from storage tanks to Munp'yong-ni Station. Road near-by.
Remarks:	Ships discharge over stern through floating pipeline with a 4½-inch stern-mooring shore-wire on each quarter. Loading capacity is about 1,300 barrels per hour. Pipelines run from pier to tank-farm. Tins and drums are loaded by lighter.

Coaling Piers (Reference ⑪).

Location:	E end of Main Harbor.
Operated by:	Chōsen Muentan (Anthracite) K.K.
Purpose:	Coaling.
Construction:	Reported to be wood.
Length:	Southernmost pier approx. 75'; other 2 piers approx. 100'.
Depth alongside:	9' to 15'.
RR:	All accessible by rail.
Remarks:	Nearest coal visible in air photographs was on bulkhead on S bank of Kujkchon-ch'on (river).

(*c*) *Miscellaneous landing facilities.* Miscellaneous landing facilities at Wonsan comprise the Fishing Harbor (References ⑬⑭⑮), Piers Nos. 1 (Reference ⑨) and 3 (Reference ②), the Chōsen-Yūsen Pier (Reference ④), and about 1,190 feet of additional quayage (References ①⑤).

Fishing Harbor (References ⑬⑭⑮); details follow:

Location:	SW corner of harbor area.
Purpose:	Unloading of fishing craft.
Length:	4 sections: approx. 720', 1,680', 240' and 540' from W to E.
Depth alongside:	13' at W section, 9' at S Section, and about 5' at E'most section.
Storage facilities:	At W section: 1 warehouse 75' by 450' and 7 smaller ones. At S section: 2 warehouses 25' by 200' and a number of smaller ones.
RR and roads:	Ample road connections. RR about 200 yds. from SW corner of Fishing Harbor.
Remarks:	Electric lighted. Fish-drying racks at W and S sections.

Pier No. 1 (Reference ⑨); details follow:

Location:	SE side of Customs Wharf.		
Construction:	Wood.		
	Face	NW side	SE side
Length:	18'	107'	107'
Depth alongside:	9½'	24'	9½'
RR and roads:	RR spurs. Road connection available.		

Pier No. 3 (Reference ②); details follow:

Location:	Near W end of Main Harbor.
Construction:	Believed to be timbered, on concrete base.
Length:	59' (13' wide).
Depth alongside:	12'.

Chōsen-Yūsen Pier (Reference ④).

Location:	In small basin on NW side of Pier No. 2.
Operated by:	International Express.
Construction:	Wood.
Length:	108' (20' wide).
Depth alongside:	3'.
Road:	Road connections only.

Additional quayage (Reference ①).

Location:	E end of Main Harbor.
Purpose:	Probably auxiliary to small boat-repair yard.
Length:	350'.
Depth alongside:	10' to 12'.
Storage facilities:	5 warehouses, each approx. 50' by 200'.

Additional quayage (Reference ⑤).

Location:	NW side of Pier No. 2.
Length:	2 sections each 420'.
Depth alongside:	4½' at NW section, to 10' at NE section.
RR and roads:	RR spurs close-by. Road connections probable.
Storage facilities:	12 warehouses, each approx. 50' by 100'.

(*d*) *North Harbor facilities.* About 9 miles north of Wonsan, in Hamgumi-man on the northwest side of Yong-hung-man, is the newly constructed Wonsan North Harbor. On the west side of the bay are believed to be a small wharf and pier and a boat basin perhaps 150 yards wide and 300 yards long. General depths within the bay range from 15 feet, close to shore, to 38 feet in the center of the bay. No additional data is available.

(*3*) ***Storage facilities.***

TABLE VI - 10 gives the data on storage space available at Wonsan. The estimate of the total area is approximate—many smaller warehouses could not be measured with any accuracy from the aerial coverage.

TABLE VI - 10
WAREHOUSES AT WONSAN

LOCATION NEAR REFERENCE NO. ON FIGURE VI - 21	NO. OF WARE-HOUSES	WIDTH (FT.)	LENGTH (FT.)	TOTAL AREA (SQ. FT.)	REMARKS
①	5	50	200	50,000	----------
③	3	30	150	13,500	----------
⑤	12	50	100	25,000	----------
⑦	1	60	350	19,000	RR available.
	1	60	300	18,000	RR available.
	4	----	-----	----------	RR available. Smaller.
⑧	1	60	300	18,000	RR available.
	7	----	-----	----------	RR available. Smaller.
⑩	1	60	100	6,000	RR available.
⑱	1	75	450	33,750	----------
	7	----	-----	----------	Smaller.
⑭	2	25	200	5,000	Also several smaller ones.
Total	45			188,250	

(*4*) ***Capacity and clearance.***

(*a*) *Actual annual traffic.* Vessels clearing the harbor in 1936 had a total tonnage of 786,519. There were 663 steam-vessels, aggregating 759,843 tons; and 702 sailing-vessels, aggregating 26,676 tons.

(*b*) *Estimated unloading capacity.* The estimated total unloading capacity of the port is 11,600 long tons per day. Of this total figure, 10,000 tons is accounted for by 20 Liberty ships working cargo in the stream, and 1,600 by cargo worked by vessels at landing facilities.

(*c*) *Facilities for clearing port.* Wonsan is an important railroad- and road-center. It is the general east coast terminus of the 2 main routes across the Korean Peninsula—the Wonsan-Kyongsong route to the south and the Wonsan-P'yongyang route to the east—both of which are followed by railroads and main roads. It is also served by coastal routes. Northeastward from Wonsan a railroad and main road roughly follow the east coast to the Manchurian frontier. Southeastward a railroad and secondary road also follow the coast; the road runs to Pusan, the railroad only as far as Samchok (Sanchoku), about 150 miles southeast of Wonsan.

However, although the road junctions are only 2 or 3 miles from the center of Wonsan, the railroad junctions are farther away: the junction of the P'yongyang railroad and the northeast coastal railroad is at Kowon, about 20 miles northward of Wonsan; the junction of the Kyongsong railroad and the southeast coastal railroad is about 8 miles southward of Wonsan.

Rail tracks serve the western landing facilities in the Main Harbor (References ⑦ through ⑪), which include all the general-cargo terminals except the Old Customs Wharf (Reference ③). Tracks are also near the oil terminals (References ⑰⑱⑲).

Road vehicles can probably clear from all the landing facilities, but at a few of them (References ①②⑪) there may be difficulty.

The canalized Kujokchon-ch'on and P'oha-ch'on (rivers) provide exit from the harbor to small industries up to perhaps 1,000 yards inland on their banks. The Kujokchon-ch'on is from 125 to 184 feet wide and 5 to 6 feet deep. Width and depth of the P'oha-ch'on are not known.

(*5*) ***Supplies.***

(*a*) *Water.* Almost half the population of Wonsan in 1936 was served by the city's waterworks which produced a daily supply of 718,000 gallons. 155 wells were also available at that date. As elsewhere in Korea, water from all sources should be considered unsafe until treated.

In the harbor, water can be laid on at the Customs Wharf and Quays (References ⑦⑧⑩) or supplied by 1 or possibly 2 water-boats of 33-ton capacity.

(*b*) *Oil and gasoline.* TABLE VI - 11 lists known and reported oil storage tanks at and near Wonsan. Near the Chōsen Oil Refinery are over 200 small tanks which have not been listed. The total capacity of the 12 listed tanks there is probably about 850,000 barrels. At Munp'yong-ni, in addition to the tank storage, there is warehouse capacity estimated at 340,000 cubic feet (24,500 square feet of floor space).

TABLE VI - 11
PETROLEUM STORAGE AT WONSAN

NO. OF TANKS	DIAMETER (FT.)	LOCATION	REMARKS
4	100	Chōsen Oil Refinery	Just installed in new tank-farm to W of refinery.
5	135	Chōsen Oil Refinery	In tank-farm to S of refinery. In this area four 135' tanks have already been removed and one 135' tank is being removed.
3	100	Chōsen Oil Refinery	
11	-----	Munp'yong-ni	Estimated capacity of the 11 tanks 165,000 bbls.

(*c*) *Coal.* A stock of about 2,000 tons of coal was maintained. About 3,000 to 4,000 tons could be supplied in a week. Coal barges were capable of supplying about 500 tons per day. Coal visible in air photographs was on the bulkhead at the south side of the Kujokchon-ch'on and on the Oil Dock (Reference ⑰).

(*d*) *Electricity.* Wonsan is on an electric power grid and can draw power generated by 4 principal hydroelectric developments; details of grid and stations are given in Chapter IX, 96.

All the general-cargo terminals (References ③⑥⑦⑧⑩) and the quays in the Fishing Harbor (References ⑬⑭⑮) have electric lighting.

(6) Repair facilities.

There are believed to be 3 small boat yards at Wonsan.

At the east end of Main Harbor near quay (Reference ①) are small shops which are believed to be engaged in the repair of small motor boats and fishing craft.

At Reference ⑫, close north of the Fishing Harbor, is a possible boat yard with 3 slipways, each about 150 feet long. A small industry, with a total area of approximately 400 by 700 feet, is located immediately to the rear of this possible boat yard.

The only known boat yard at Wonsan (Reference ⑯) is close east of the Fishing Harbor. In air photographs, the largest vessel on the ways was about 135 feet long. The yard was apparently being used for repair, but was capable of construction.

G. Pusan (Fusan).

(35°06'N, 129°02'E)

Pusan, on the southeast coast, is the third largest city and leading port of Korea (PLANS 15 and 39). Only 120 miles from Japan, Pusan is the transshipment point for military supplies and troops to the continent, and rice, cotton, steel, and coal to Japan. Prisoner of war reports indicate that it is a regular assembly point for many Japanese convoys. The port also serves as a connecting link between Japan and South China; the double-track Pusan-Kyongsong (Keijō)-Mukden railroad, terminates at the waterfront and 1 pier is used for the direct transfer of cargo and passengers from a ferry service that has direct connections with a similar landing facility at Shimonoseki in Japan proper. Originally the ferry service, which takes 8 hours, operated twice daily from each end, but now may be limited to 1 trip each way per day.

Although primarily devoted to commerce, Pusan has some industries, including the Chōsen Heavy Industry Co., largest shipbuilding company in Korea, and the following: a diesel engine plant reported working for the Japanese Navy, an important iron and steel products fabricating plant, a bean and cotton seed oil refinery reported making explosives, a gunpowder plant, an oil refinery, the second largest hemp plant in the Japanese Empire, a fish products processing plant, a tin can plant, an aircraft assembly plant, 11 electric light bulb factories, 4 rubber companies, and some other miscellaneous factories.

The well protected harbor area is divided into North and South Harbors, both with additional artificial breakwater protection. Recent extensive improvements of the harbor area include dredging, reclamation, and construction of a seawall and a new pier. The harbor area can provide about 14 first-, 20 second-, and 29 third-class anchorage berths.

The primary landing facilities are in North Harbor which has all the berths for ships drawing 20 feet or more. In all, the primary facilities at Pusan can provide 34 vessel berths alongside, nine of which handle vessels above 3,000 tons. A thirty-fifth vessel berth is provided by mooring buoys near the 2 main piers. An additional 5 berths for vessels drawing 29 feet will become available with the completion of the fourth major pier.

In addition to the primary landing facilities available at 3 large piers, 5 large quays, and 6 wharves, there are 2 specialized oil handling facilities—an oil pier and an oil basin, and a number of facilities of considerable size for handling small vessels. The port has at least 124 warehouses with a total capacity conservatively estimated at over 2 million square feet. Mechanical handling facilities are somewhat limited.

Daily unloading capacity is estimated at 21,800 long tons—14,800 tons discharged alongside and 7,000 long tons worked in the stream by 14 Liberty ships. Completion of the new pier would raise the unloading capacity alongside to an estimated 11,500 long tons per day. Railroad clearance is available to all of the primary landing facilities in North Harbor.

(1) Harbor.

Pusan's well protected harbor area is at the head of a bay formed between Tanggang-mal and Sungdu-mal (FIGURE VI - 24). An island, Mok-to, protects the harbor on the south, divides the approach into northern and southern entrances, and fronts on the south area of the North Harbor and the west area of the South Harbor. North and South Harbors are divided by the 620-foot span Pusan drawbridge connecting the city of Pusan with the island of Mok-to (FIGURE VI - 25).

Protection against winds and tidal currents is provided by a breakwater and training wall at the South Harbor entrance, and 2 breakwaters and 2 jetties at the North Harbor entrance. Observation based on aerial reconnaissance indicates approximately 440 feet at the south end of the southern breakwater to the North Harbor to be either under water or uncompleted.* The water area north and west of these breakwaters comprises about 2,410 acres, the greater part of which has depths of more than 24 feet.

There are 2 major basins—one used as an oil landing facility—and 4 minor basins in North Harbor. South Harbor has 1 major and 2 small basins. Outside North Harbor, there is a boat harbor at the Quarantine Station.

Recent, extensive harbor improvements at Pusan include:

Dredging a large area off Piers Nos. 2 and 4 (References ③ through ⑥)** to a depth of 29½ feet;

Dredging a large area of Pusanjin (Fusanchin) basin (Reference ⑦) to 24 feet;

Reclamation of an area, about 1,400 feet wide, north of Pier No. 3, and an area, about 1,050 feet wide, south of Pier No. 3 (References ③④⑤);

Considerable reclamation at Pubong-mal (Fuho-matsu) References ⑫⑬);

Probable dredging around 2 new moles at Reference ⑮;

Construction of a seawall at Reference ㉒.

(a) Entrance channels. The northern entrance is about 2¾ miles wide at its mouth between Sungdu-mal and Sangi-mal (Sōi-matsu, Sein Kutsu) with depths up to 20 fathoms. From the mouth, depths gradually decrease to 5½ to 6 fathoms in a passage about 300 yards wide leading to the inner harbor, and remain at approximately 6 fathoms in the anchorage at the southern end of the North Harbor. Dangers to navigation in the northern entrance are covered in the various pilots and sailing directions.

* Indicated to be complete in the latest correction for Chart 313, issued by the Japanese Hydrographic Office.

** References are encircled numbers on FIGURE VI - 24.

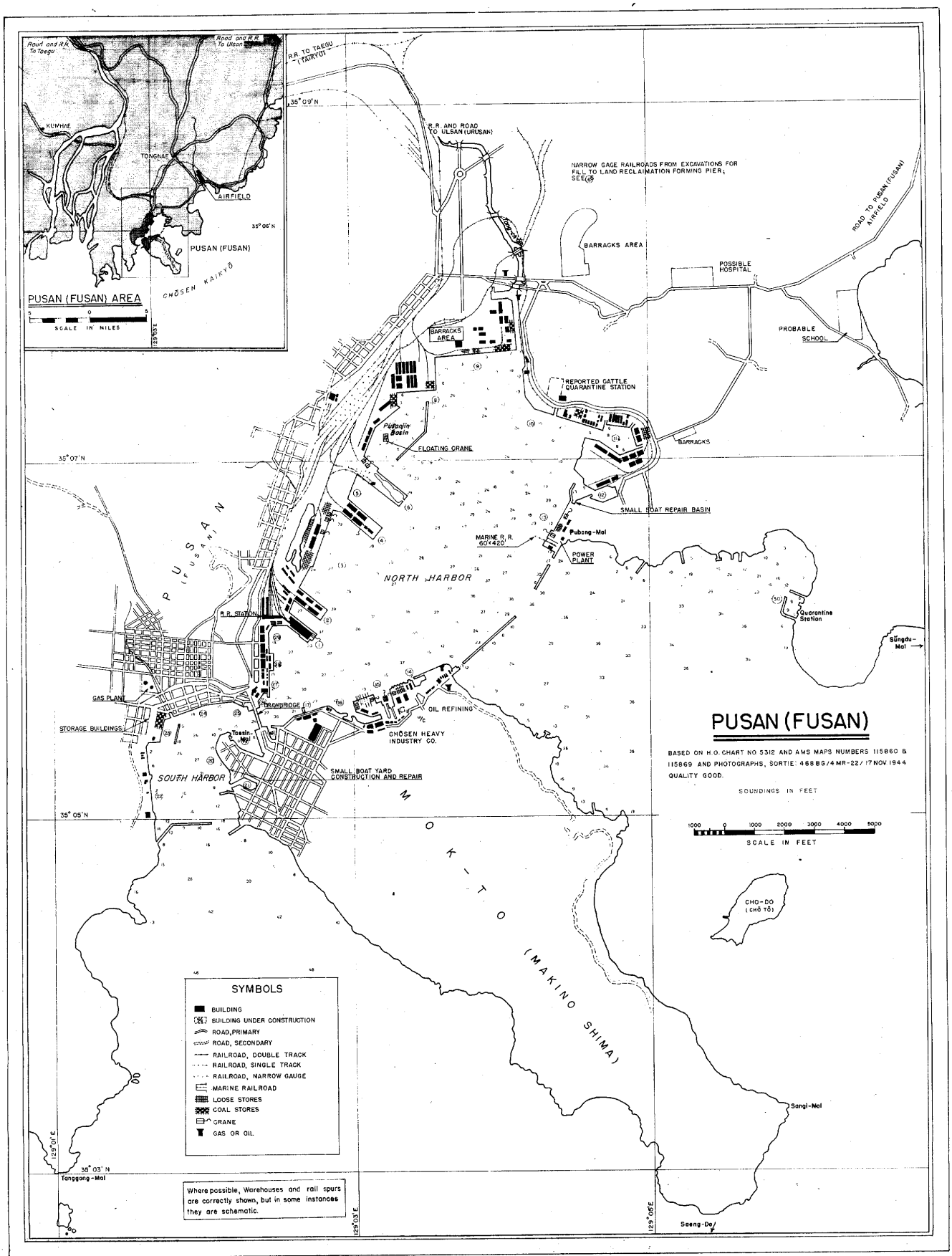

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FIGURE VI-24. *Pusan.*
Port plan showing location of facilities by encircled reference numbers.

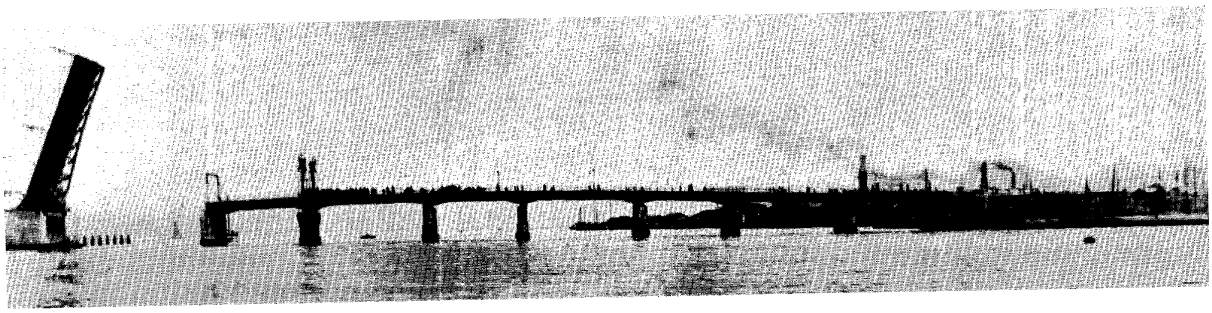

FIGURE VI - 25. *Pusan.*
Drawbridge connecting Pusan and Mok-to, probably looking east-northeastward. 1935.

The southern entrance between Mok-to and Tanggang-mal, relatively free of dangers, is comparatively deep in its southern part, but shoals to 5 fathoms about one mile southward of Taesen-mal (Taijin-matsu, Teshin Kutsu); about 400 yards farther northward there is a bar with irregular depths of 1 to 3½ fathoms. Northward of this bar, depths increase to over 4 fathoms, but decrease again to 2½ fathoms in the fairway of a narrow passage. Although reports indicate the southern entrance is available only for vessels of a draft not exceeding 10 feet, it is believed that vessels of greater draft could enter the South Harbor.

(*b*) *Anchorages and buoys.* Good anchorage can be obtained in the Pusan harbor area during all seasons of the year. The available anchorage berths total about 14 first-, 20 second-, and 29 third-class anchorage berths, distributed as follows:

North Harbor—9 second- and 24 third-class anchorage berths. Bottom is largely mud; some sand and shell in the southern area. Vessels anchoring in the vicinity of Pier No. 1 (Reference ①), or going alongside the piers, must observe that the tidal streams are strong and irregular here, especially near high water.

South Harbor—at least 3 third-class anchorage berths, largely mud and sand bottom.

Outside North Harbor—14 first- (6 of which lie over, or in the vicinity of, submarine cables), 11 second-, and 2 third-class anchorage berths. The entire area is open to the sea on the south.

Outside South Harbor—an area of approximately 2½ square miles, with depths of 16 to 60 feet, is available. However, the area is exposed on the south, and 6 submarine cables run its length.

Two buoys, at the east side of the anchorage area off Piers Nos. 1 and 2 (References ①②), have alongside depths of 5¾ to 7½ fathoms. They are estimated to provide berthage for one 450-foot vessel.

(*c*) *Significant hydrographic features.* On the southeast coast of Korea, general tidal current velocities vary from 1 knot to riptides of 5½ knots, and in conjunction with tidal ranges of from 2¾ feet to 4 feet at Pusan, increase navigational difficulties in the region.

For the Pusan harbor area and its approaches, tidal data are as follows: within the Pusan harbor area the tide range is 1¼ feet, springtides rising 4 feet, and neaps rising 2¾ feet. The mean high water interval is 8 hours and 51 minutes. Tidal currents within the Pusan harbor area, with the exception of the vicinity of Pusan drawbridge, are generally weak, not exceeding 0.5 of a knot.

In the vicinity of the drawbridge the tidal currents for about 4 hours after high tide until about 4 hours after low tide set west; for about 4 hours after low until about 4 hours after high, set east. In the vicinity of the entrance between the breakwater of North Harbor the tidal currents set northwest from about 4 hours after high tide until about 4 hours after low tide, and flow southeast from about 4 hours after low until about 4 hours after high tide.

In the area of a line connecting the south corner of Mok-to and the northeastern entrance to the bay, the flood stream sets southwest and the ebb stream northeast. The current rate is about 1.8 knots.

In the vicinity of the south coast of Mok-to and Saeng-do (Segu-to), an island southward of Mok-to, the current is extremely strong, especially the flood stream in the area east of Sangi-mal, Sein Kutsu. The ebb stream is strong between Mok-to and Saeng-do. In the area east of Sangi-mal (Sein Kutsu) and Mok-to lighthouse, the flood stream largely sets southwest; one part of it reaches the sea north of Saeng-do. Although the ebb stream for the most part flows northeast between Mok-to and Saeng-do, one part is reported at the turn sometimes to set towards the coast line. In the Saeng-do area the current-rate reaches 2.5 knots, frequently causing violent rapids at the ebb.

(*d*) *Local weather.* The coldest month in the year, January with a maximum average daily temperature of 44° F., is accompanied by the highest average wind velocity (9.8 m.p.h.); the hottest month is August with a maximum, average daily temperature of 85° F. The highest and lowest recorded temperatures, 96° F. and 7° F. respectively, have occurred in the months of extremes. Eighty-three per cent, for July, has been the highest percentage of average relative humidity. The average total precipitation over a 25-year period has been 54.5 inches. There is little fog, ice or snow, and north winds prevail during 9 months of the year—February through May and August through December.

(*2*) ***Landing facilities.***

The primary landing facilities at Pusan are in North Harbor which has all the berths for ships drawing 20 feet or more. In both North and South Harbors there are 3 piers over 1,200 feet long, a fourth pier of comparable dimensions under construction, 5 large quays, 6 wharves, an oil pier, an oil basin, and 11 other boat basins of varying sizes. Outside of North and South Harbors, there are 11 scattered, small piers and a small harbor formed by breakwaters at the quarantine station.

TABLE VI - 12 lists the distribution of the 35 major vessel berths at Pusan. Berths for five 6,500-ton ships, drawing 27 feet, which will become available with the completion of Pier No. 4 (Reference ⑥) are not included in this table.

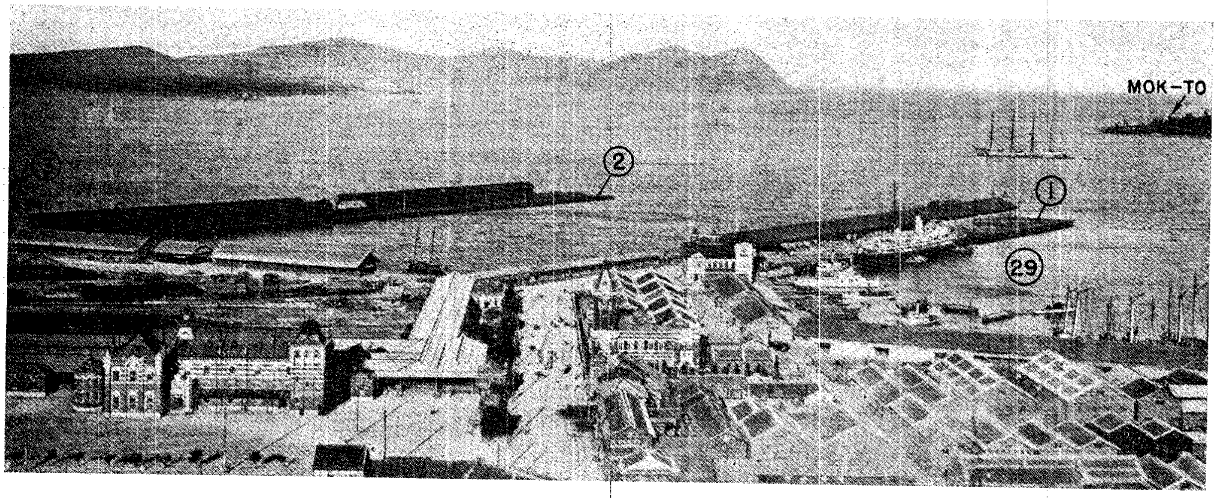

FIGURE VI - 26. *Pusan.*
Piers Nos. 1 and 2 (References ①②), looking eastward from inland of railroad station toward north entrance to harbor. Before 1919.

TABLE VI - 12

DISTRIBUTION OF MAJOR VESSEL BERTHS AT PUSAN

BERTHS AVAILABLE	VESSEL LENGTHS (FT.)	ALLOWABLE DRAFTS (FT.)	REFERENCE ON FIGURE VI - 24
1	560	29	②
1	450	25	①
3	450	24 to 28	②
3	450	27	③
4	450	27	④
1	450	30	⑤
1	450	27	(Between Mooring Buoys, off References ①②)
1	385	24	①
3	300	21	①
1	300	21	②
3	260	17	⑳
6	225	16	⑦
2	225	15	㉓
3	225	16	㉔
2	225	16	㉘
35			

Even some of the largest landing facilities are not too well equipped with mechanical handling facilities. Land cranes are distributed as follows:

1 at the end of Pier No. 1 (Reference ①).

3 (possibly 4) at Reference ③.

1 on the south side of Pier No. 3 (Reference ④).

2 at industrial mole (Reference ⑬).

1 hammerhead, 1 small, and 3 bridge cranes at the Chōsen Heavy Industry Work, Reference ⑮.

2 reported cranes at Reference ㉙.

Two floating cranes have been identified in aerial photographs near References ⑦ and ⑮. A third possible floating crane also may be in the harbor area.

Detailed information concerning harbor craft is not available; however, the known craft in 1932 were as follows: 150 lighters with a total tonnage of 4,980 tons to serve ships anchored in the harbor. The largest of these craft were of 77 tons, the smallest of 19 tons. The average tonnage of these craft, including 15 craft with a total tonnage of 465 tons, was 33 tons. There were also 12 steam tugs between 9 and 83 tons, and 9 motor launches between 8 and 25 tons. It is highly probable, however, that present harbor craft figures are considerably above those given for 1932.

(*a*) *General-cargo terminals.* The Nos. 1, 2 and 3 Piers, Nos. 1 and 2 Quays, and 5 wharves comprise the general-cargo terminals. Piers Nos. 1, 2, and 3 constitute the most important group of terminals.

No. 1 Pier (Reference ①) (FIGURES VI - 26 and VI - 27); details follow:

Location:	At the RR terminus, North Harbor.		
Purpose:	Combined passenger and freight trade.		
Construction:	Concrete and wood.		
	Face	N side	S side
Length:	300′ + 50′ + 90′	1,200′	912′
Depth alongside:	18′	24′	21 to 27′
Berthage:	Three 3,000-ton vessels drawing 21′; one 5,000-ton vessel drawing 24′; and one 7,000-ton vessel drawing 25′.		
Capacity (lbs. per sq. ft.):	Probably unlimited.		
Storage:	3 sheds on N side are joined togther by smaller buildings to form one building 90′ x 1,100′. Some, or all, of sheds may be of 2 stories.		
Cranage:	1 crane at end of pier. Possible floating based crane on N side.		
RR:	5 RR spurs.		
Unloading capacity:	2,400 long tons per day.		
Water:	13 hydrants on N side (cap. 5,200 tons every 10 hours).		
	6 hydrants on S side (cap. 3,000 tons every 10 hours).		
Remarks:	Face in 3 sections.		
	Passenger shed connecting with station hotel—75′ by 950′. Passenger shed and sheds on the N side are connected by 2 overhead passageways. Concourse between the sheds, covered, is 30′ wide and 1,000′ long. Material is expeditiously handled, as RR platforms are on the same level with car floors, enabling cargo to be trundled off with a minimum of effort.		
	Bulkhead on N side of Pier No. 1—540′ long with depths alongside 9′ to 11′; 1 RR spur; (33 military vehicles behind wharf in aerial coverage).		

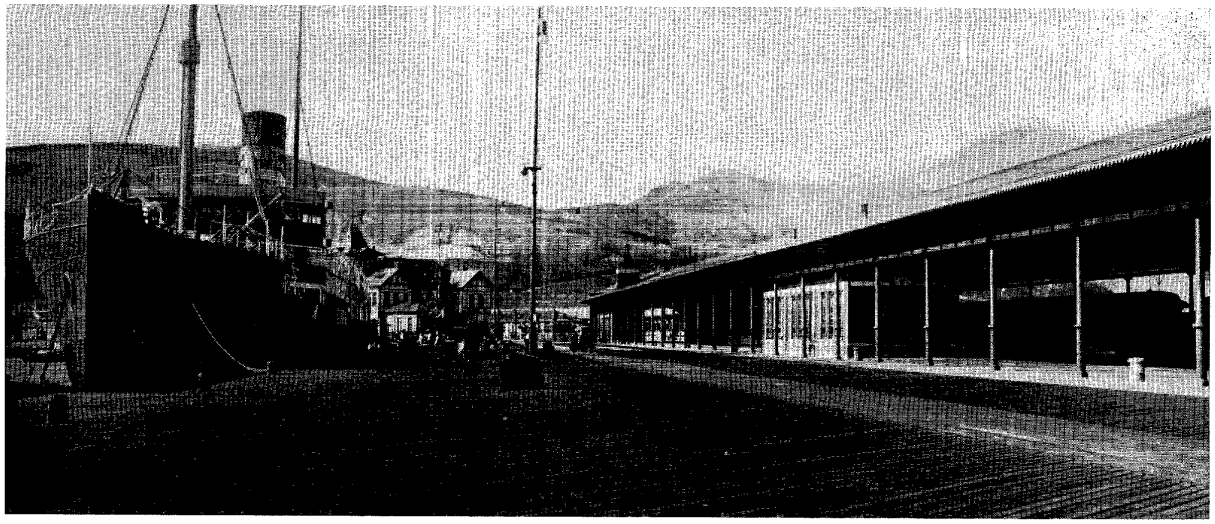

FIGURE VI - 27. *Pusan.*
Pier No. 1 (Reference ①), looking northwestward, showing passenger shed.

No. 2 Pier (Reference ②) (FIGURE VI - 26); details follow:

Location:	At the RR terminus, North Harbor.
Purpose:	Freight trade. Shimonoseki-Pusan ferry docks at S side. Oil reported discharged here at times.
Construction:	Concrete and wood.

	Face	N side	S side
Length:	400′	1,450′	1,320′
Depth alongside:	34′	31 to 35′	24 to 34′

Berthage:	One 3,000-ton vessel drawing 21′; two 7,000-ton vessels drawing 28′; one 7,000-ton vessel drawing 24′; and one 17,500-ton liner drawing 29′.
Capacity (lbs. per sq. ft.):	Probably unlimited.
Storage:	N side: 3 double-ridge warehouses, each 120′ by 315′; S side: 2 triple-ridge warehouses, each 105′ by 500′.
RR and road connections:	5 RR spurs: 2 on S side, 3 on N side.
Unloading capacity:	3,400 long tons per day.
Water:	13 hydrants on N side (cap. 4,500 tons every 10 hours). 13 hydrants on S side (cap. 5,200 tons every 10 hours).
Remarks:	Material is expeditiously handled, as RR platforms are on same level with car floors, enabling cargo to be trundled off with a minimum of effort. (Aerial coverage showed supplies dumped on S side of S railroad spurs and between the 2 groups of spurs. Stores on extreme end of pier.) Pipeline runs from pier to storage tanks partially buried in side of nearby mountain.

No. 1 Quay (Reference ③); details follow:

Location on waterfront:	N side of No. 2 Pier, North Harbor.
Construction:	Believed to be concrete, retaining solid fill.
Length:	2 sections: 2,200′ section with 950′ section setting back about 45′.
Depth alongside:	2,200′ section—27′ 950′ section—23 to 25′
Berthage:	Three 7,500-ton vessels drawing 27′.
Capacity (lbs. per sq. ft.):	Probably unlimited.
Storage:	2 double-ridge warehouses, each 75′ by 350′.
Cranage:	3 cranes, possibly 4.
RR:	1 RR spur runs on each side of warehouses.
Unloading capacity:	3,600 long tons per day.
Remarks:	Quayside is in operation, although apparently very recently completed. Largest craft present in aerial coverage was about 110′ long. This fact, however, is not believed to be indicative of the real berthing capacity of the quay, as only one large vessel was in the harbor in the occasion of each sortie. Loose stores were scattered entire length of quayside, most of which were apparently bales or crates approximately 15′ square. Inland, between the area and the main rail line, land reclamation continues. Area yet to be filled is approximately 3,150′ long and 600′ wide.

No. 3 Pier (Reference ④); details follow:

Location:	3,150′ N of No. 2 Pier, North Harbor.
Purpose:	Probably general trade.
Construction:	Believed to be concrete, retaining solid fill.

	Face	N side	S side
Length:	450′	1,550′	1,440′ +275′
Depth alongside:	30′	30′	30′

Berthage:	Four 7,500-ton vessels drawing 27′.
Capacity (lbs. per sq. ft.):	Probably unlimited.
Storage facilities:	N side: 2 warehouses, each 130′ by 360′. S side: 2 warehouses, each 130′ by 360′.
Cranage:	1 crane on S side.
RR:	At least 4 RR spurs.
Unloading capacity:	4,400 long tons per day.
Remarks:	Aerial coverage showed: about 20 military vehicles present; loose stores at end of pier; in addition to the warehouses, 2 smaller buildings—60′ by 250′ and 40′ by 90′.

Bulkhead Wharf (Reference ⑤); details follow:

Location:	N side of No. 3 Pier.
Purpose:	Probably general trade.
Construction:	Believed to be concrete, retaining solid fill.
Length:	800′.
Depth alongside:	30′
Berthage:	One 7,000-ton vessel drawing 30′.
Capacity (lbs. per sq. ft.):	Probably unlimited.
Storage:	5 warehouses, largest of which is 30′ x 135′.
Unloading capacity:	1,000 long tons per day.

Remarks: Aerial coverage shows inland is an undetermined concrete structure 80′ wide and 435′ long. It appears that it will eventually be covered by earth. 80 military vehicles on S side. S of it a drainage canal is being covered. 1,500′ N of this structure is an unidentified structure 75′ by 420′.

No. 4 Pier (Reference ⑥); details follow:

Location:	800′ N of No. 3 Pier, North Harbor.		
Purpose:	Not yet in use.		
Construction:	Apparently to have concrete retaining-walls and solid fill.		
Length:	Face 425′	N side 640′ + 80′ + 1,300′	S side 1,775′
Depth alongside:	30′	30′	30′
Berthage:	Upon completion: five 6,500-ton vessels drawing 27′.		
Remarks:	Pier, somewhat larger than No. 3 is still under construction; gap in face of pier about 75′ wide; 50% still flooded. 2 RR spurs on side connect with main RR line and run about half the length of the pier. 1 spur on part of N side. Also a number of temporary narrow-gauge spurs are servicing construction work. Their roadbed may become that of a new main line. 2 cranes on pier probably for construction purposes.		

No. 2 Quay (Reference ⑦); details follow:

Location on waterfront:	Pusanjin basin, North Harbor.
Length:	3 sections: 1,200′, 1,000′, and 450′.
Depth alongside:	16′ to 23′ (general within the basin).
Berthage:	Six 1,200-ton vessels drawing 16′.
Storage:	4 double-ridge warehouses, each 75′ by 250′.
RR and roads:	1 RR spur, inland of warehouses, connects with main line. RR marshalling-yard (26 tracks in widest area) lies inland. Road connections also available.
Remarks:	Aerial coverage showed small stores alongside quay.

South Harbor Wharf No. 1 (Reference ⑳); details follow:

Location:	E side, South Harbor.
Purpose:	Reported to be military.
Length:	3 sections: total length approx. 1,750′.
Depth alongside:	12′, off southernmost section, to 24′.
Berthage:	Three 1,700-ton vessels drawing 17′.

South Harbor Wharf No. 2 (Reference ㉓); details follow:

Location:	South Harbor, NW side.
Length:	3 sections: 150′, 750′, and 850′.
Depth alongside:	15′.
Berthage:	Two 1,200-ton vessels drawing 15′.
Storage:	17 buildings 45′ by 75′ each, and foundations for 16 more in area.
Remarks:	850′ detached breakwater about 140 yds. off. Probably acts as a training wall. No quayage available on reclaimed area to the S; however, a bulkhead has been constructed.

South Harbor Wharf No. 3 (Reference ㉔); details follow:

Location:	South Harbor, NW side.
Length:	3 sections: 2,150′ overall.
Depth alongside:	12′ at landing stage on N section, to 19′.
Berthage:	Will probably berth three 1,200-ton vessels drawing 16′.
Remarks:	Small ferry operates between landing stage on wharf and landing stage in the Takehashi-Shipyard Basin at Reference ⑩.

North Harbor Wharf (Reference ㉘); details follow:

Location:	About 330 yards SW of No. 1 Pier, North Harbor.		
Length:	Face 600′	N side 100′	S side 100′
Depth alongside:	16′ to 19′		
Berthage:	Probably two 1,200-ton vessels drawing 16′.		
Remarks:	Small pier on N end; landing stage on S end. Small ferry runs from landing stage to Mok-to at a point just NE of basin at Reference ⑱.		

(*b*) *Specialized-cargo terminals.* The Rising Sun Oil Pier and the Oil Basin—both in North Harbor—are the specialized-cargo terminals at Pusan.

Rising Sun Oil Pier (Reference ⑰) (FIGURE VI - 28); details follow:

Location:	Mok-to, SW of Chōsen Heavy Industry Co.
Operated by:	Rising Sun Oil Co.
Purpose:	Discharging petroleum and loading fuel for shipment in cases and drums.
Construction	Wood.
Storage:	1 triple-ridge warehouse, 120′ by 200′; 1 triple-ridge warehouse, 60′ by 75′; 1 triple-ridge warehouse, 60′ by 90′; 1 warehouse, 60′ by 150′ (may be building which houses tin-can factory).

FIGURE VI - 28. *Pusan.*
Rising Sun oil installation (Reference ⑰), looking northward.

RR:	1 narrow-gauge spur.
Remarks:	Tankers moor offshore and discharge through floating pipeline.

Oil Basin (Reference ⑪); details follow:

Location:	NE side North Harbor.
Purpose:	Believed used exclusively for small craft handling oil.
Length:	6-sided basin with lengths of approx. 300′, 900′, 725′, 750′, 800′ and 500′.
Depth alongside:	General depths of 5′.
Storage:	N side: 5 warehouses, 50′ by 270′; 1 warehouse, 75′ by 180′; 1 warehouse, 60′ by 330′. E side: 5 warehouses, 150′ by 260′; 1 warehouse, 90′ by 165′; 2 warehouses, 75′ by 225′. S side: 2 warehouses, 100′ by 500′.
RR:	Tracks circle behind basin.
Remarks:	Aerial coverage showed that, on the NE side, behind the warehouses, stores appear to be oil drums 10′ in diameter and 15′ long. The presence of 4 oil barges, about 130′ long, further confirms both this possibility and the possibility that the basin is used for oil purposes.

(*c*) *Miscellaneous landing facilities.* Miscellaneous landing facilities in North and South Harbors comprise the Customs Wharf, the Central Wholesale Market Quay, the Kato Rice Refinery Wharf, an industrial mole, and the Nos. 3 and 4 Quays—installations of considerable size, but suitable only for relatively small craft. In addition, outside of North and South Harbors are 8 small piers along both shores of the north entrance channel. Landings probably used only by fishing boats and native craft are along the shore of the northeastern entrance point to the harbor. The seawall at Reference ㉒ is not used as a landing facility. Reference ⑮, the Chōsen Heavy Industry shipbuilding yard, is described in Topic 61, G, (6), Repair Facilities.

Customs Wharf (Reference ㉙) (FIGURE VI-26); details follow:

Location:	Forms the S bulkhead to No. 1 Pier, North Harbor.
Length:	Three sections: overall length of approx. 1,300′.
Depth alongside:	About 14′.
Berthage:	Small craft only.
Cranage:	2 cranes reported.
Remarks:	Landing stage on N section; small pier and landing stage just off southernmost section.

Central-Wholesale-Market Quay (Reference ㉗); details follow:

Location:	Immediately S of Customs Wharf, North Harbor.
Purpose:	Probably to serve the large market located inland.
Length:	Approx. 750′.
Depth alongside:	About 18′.
Berthage:	Small craft only.
Remarks:	Centrally located pier is about 130′ long.

Kato-Rice-Refinery Wharf (Reference ⑧); details follow:

Location:	Approx. 850 yards NNE of No. 3 Pier.
Purpose:	Probably by the Kato Rice Refinery.
Construction:	Believed to be concrete.
Length:	Angular-shaped with side lengths of about 1,250′ and 1,175′.
Depth alongside:	3′ to 6′.
Berthage:	Small craft only.
Storage:	9 warehouses: 7 of which are 50′ by 500′, and 2 of which are 70′ by 500′. Several small buildings, adjacent to each other, total 150′ by 120′ in area.
RR:	1 spur.
Remarks:	Aerial coverage showed 6 landing stages along wharf. Just W of the warehouses are 4 buildings, one with a stack, which may constitute the Kato Rice Refinery; building sizes are 90′ by 480′, 150′ by 90′, 75′ by 90′ (bldg. with stack), and 30′ by 150′. Located W of these buildings and surrounded by smaller ones, the largest of which is 35′ by 190′, are six tanks. Tanks are approx. 15′ in diameter and 45′ long, lying on their sides. Their purpose is unidentified.

No. 3 Quay (Reference ⑨); details follow:

Location:	Northernmost facility in North Harbor.
Purpose:	Seems to be used for coaling purposes. Reported used as a berth for submarines.
Construction:	Believed to be concrete.
Length:	Angular-shaped with lengths of 2,900′ on S side and 1.700′ on E side.
Depth alongside:	Shallow depths alongside; 9′ just off.
Berthage:	Small craft only.
Storage:	29 warehouses: 5 large warehouses, not too accessible, each 75′ by 300′; 4 warehouses 75′ by 210′; and 20 warehouses of various sizes, the largest being 60′ by 200′.
RR:	Served by RR spurs leading off spur to main line. Small marshalling yard; quay-side littered with loose stores.

No. 4 Quay (Reference ⑩); details follow:

Location:	NE section of North Harbor.
Length:	3 sections: 2,500′, 390′, and 1,080′.
Depth alongside:	7′ to 12′.
Berthage:	Small craft only.
Storage:	18 warehouses: 11 warehouses 60′ by 160′; 1 warehouse 60′ by 225′; and 6 warehouses, the largest of which is 60′ by 150′.
RR:	1 spur.
Remarks:	Lighter-slip near center of quay.

Industrial Mole (Reference ⑬); details follow:

Location:	SE across the harbor from Pusanjin basin.	
Purpose:	To serve small industry (unidentified).	
Construction:	Concrete or masonry, retaining solid fill.	
Length:	NW side 950′ + 75′ + 365′	SW side 383′
Depth alongside:	10½′ to 12′	15′ to 19½′
Berthage:	Believed to be used only by small craft.	
Capacity (lbs. per sq. ft.):	Probably unlimited.	
Cranage:	2 cranes.	
Road:	Road available.	
Remarks:	Cylinders about 10′ in diameter and 15′ high, probably of metal, are being made at industry on mole. The use of these cylinders has not been determined. 365-ft. section on the NW side is broken by a marine RR (ramp about 60′ wide and 240′ long).	

(*d*) *Boat-basins.* Boat basins in the North Harbor, excluding the Oil Basin already discussed, consist of a major basin and 4 minor basins. The major basin (Reference ⑫) is 9-sided, with a smaller basin on the south side. Maximum width of the basin is 465 feet; it is 750 feet long. An angular breakwater has a total length of 550 feet. Three warehouses, 75 feet by 225 feet, 100 feet by 630 feet, and 100 feet by 240 feet, are on the north side of the basin, and 1 warehouse, 75 feet by 270 feet, is on the east side of the basin.

Minor basins in the North Harbor are:

Two small basins (References ⑭⑯) which are auxiliary to the Chōsen Heavy Industry Company's facilities at Reference ⑮.

One basin (Reference ㉘) protected by a jetty on the east and piles on the south.

A boat harbor (Reference ⑱) with sides of approximately 375 feet, 100 feet, 125 feet and 380 feet and general depths of at least 6 feet.

South Harbor contains 1 major basin and 2 small basins.

The major basin (Reference ⑲) with general depths ranging from 4 feet to 13 feet at the entrance, is probably used by the Standard Oil Company and/or the Takehashi Shipyard.

The other 2 basins are: one at Reference ㉕, cut off by piles on the south side, and Satsuma Basin (Reference ㉑), which is entered by the Satsuma Canal. The entrance depth at Satsuma Basin is 6 feet. It, too, may be used by the Standard Oil Company.

Outside of the North Harbor, there is a boat harbor with 2 small piers (Reference ㉚) at the quarantine station, with general depths of 6 to 16 feet. This basin has been recently formed by the construction of 2 breakwaters. Within 200 yards of the breakwaters, general depths run from 16 to 30 feet over mud and shell bottom.

(3) Storage facilities.

Pusan has at least 124 warehouses with a total capacity conservatively estimated at well over 2 million square feet. Most of the warehouses are on or near the important landing facilities. The principal warehouses are owned by the Chōsen Soko Kaisha, the Chōsen Shōgyō Ginko Soko, the Oike Shōten Soko, and the Pusan branch of the Hokusen Soko K.K. TABLE VI - 13 gives details, largely taken from interpretation of available aerial photography, on the principal warehouse concentrations at Pusan. Estimates of capacity are believed to be conservative because some of the warehouses may have more than 1 floor. In addition to the petroleum warehouses listed in TABLE VI - 13 as being adjacent to the Oil Basin (Reference ⑪), there are 6 Standard Oil Co. godowns, with a total capacity of 30,196 square feet, on Mok-to, southeastward of Reference ⑲.

Open storage ground also is available at Pusan.

TABLE VI - 13

STORAGE FACILITIES AT PUSAN

LOCATION AND REFERENCE NO. ON FIGURE VI - 24	NO. OF WAREHOUSES	WIDTH (FEET)	LENGTH (FEET)	TOTAL AREA (SQ. FEET)	REMARKS
① N side of No. 1 Pier	1	90	1,100	99,000	RR. Open space available
Bulkhead, N side of No. 1 Pier	2	70	210	29,400	Do.
Upland of bulkhead	1	45	315	14,175	
	1	45	405	18,225	All accessible on each side by rail
	2	45	500	45,000	
② N side of No. 2 Pier	3	120	315	113,400	RR
② S side of No. 2 Pier	2	105	500	105,000	RR
② Upland of No. 2 Pier	6	70	315	97,050 (Approx.)	Dimensions are of largest one
③ Quay	2	75	350	52,500	RR spur on each side
④ N side of No. 3 Pier	2	130	360	93,600	
④ S side of No. 3 Pier	2	130	360	93,600	2 smaller buildings (60 feet by 250 feet and 40 feet by 90 feet)
⑤ Bulkhead, N side of No. 3 Pier	5	30	135	16,050 (Approx.)	Dimensions are of largest one
⑦ Quay	4	75	250	75,000	1 RR spur inland
⑧ Kato Rice Refinery Wharf	7	50	500	175,000	Serviced by 1 RR spur
	2	70	500	70,000	
⑨ No. 3 Quay	5	75	300	22,500	RR spurs
	4	75	210	15,750	Do.
	20	60	200	154,500 (Approx.)	Do. Dimensions are of largest one
⑩ No. 4 Quay	11	60	160	105,600	
	1	60	225	13,500	
	6	60	150	34,000 (Approx.)	Dimensions are of largest one
⑪ Oil Basin, N side	5	50	270	67,500	Roof not quite completed on 1, all may be used for oil
	1	75	180	13,500	May be used for oil
	1	60	330	19,800	Do.
⑪ Oil Basin, E side	5	150	260	195,000	Do.
	1	90	165	14,850	Do.
	2	75	225	33,750	Do.
⑪ Oil Basin, S side	2	100	500	100,000	RR spur along total length
⑫ Boat Basin, N side	1	75	225	16,875	Also miscellaneous small buildings
	1	100	630	63,000	
	1	100	240	24,000	
⑫ Boat Basin, E side	1	75	270	20,250	
⑰ Rising Sun Oil Pier	1	120	200	24,000	Triple-ridge, probably for oil
	1	60	150	9,000	Probably for oil
	1	60	90	5,400	Triple-ridge, probably for oil
	1	60	75	4,500	Do.
㉓ S Harbor Wharf No. 2	17	45	75	57,375	16 more buildings in area seem to have foundations laid.
Totals	124			2,111,650	

(4) *Capacity and clearance.*

(*a*) *Actual annual traffic.* In 1936, a total of 75,432 vessels used the port—8,053 steamships with an aggregate tonnage of 2,751,988 tons; 67,379 sailing ships with an aggregate tonnage of 6,277,766 tons. Customs records for 1943 indicate a shipping average of 80,000 tons per week.

(*b*) *Unloading capacity.* The estimated total unloading capacity of the port is 21,800 long tons per day. This total figure comprises 14,800 long tons discharged alongside and 7,000 long tons worked in the stream by 14 Liberty ships. The completion of No. 4 Pier would raise the alongside capacity by an estimated 4,500 long tons.

(*c*) *Facilities for clearing port. Railroad.* The harbor belt line serves the piers and other landing facilities in North Harbor, but does not extend to South Harbor or the facilities on the island, Mok-to. Tracks and spurs are available on or near North Harbor facilities, References ① through ⑫, but the remainder of the facilities do not have rail connections.

Pusan is at the base of a "Y" forming the backbone of the Korean rail network. One railroad of high strategic importance to the Japanese and three other important lines run out of Pusan. The government-owned principal trunk line (Trans-Peninsula Line), double-tracked and standard gauge, runs north to An-tung, Manchuria, via Taegu and Kyongsong. Here connection is made with the An-tung - Mukden line of the South Mukden line of the South Manchurian Railway. Express trains on this line, carrying freight and passengers, run through the city past the main station, and on to No. 1 Pier, where the ferry to Shimonoseki receives its load directly from the train. This is a fast, regular transportation facility connecting Japan with Korea and Manchuria.

Secondary railroad routes serving Pusan are: the government-owned Pusan to Kyongsong line, via Kyongju and Andong; a line running to Masan and Mokp'o, which connects with the main line at Samnangjin, about 21 miles north of Pusan; and a new east coast railroad, scheduled to be completed between Pusan and Wonsan in 1942, which was still not completed north of P'ohang-dong in June of that year. These 3 lines are single-tracked and standard gauge.

Roads. With the exception of Reference ⑳, which is near the railroad serving Pier No. 1 (Reference ①), roads and streets, where available, provide the only overland clearance for the landing facilities, References ⑬ through ⑳. This includes all the facilities in South Harbor and those located on the island, Mok-to. The only overland connection between Mok-to and Pusan is a drawbridge. The main landing facilities at Pusan are accessible by truck. First-class highways connect Pusan with the major cities of Korea.

The main highway extends northwest to Kyongsong approximately parallel to the double-track railroad. An east coast highway extends north to Wonsan, via Ulsan, and a short road runs westward to the estuary of the Naktong-gang.

Water. The Imperial Japanese Government Railways operate a ferry service between Pusan and Shimonoseki across the Korea Strait twice daily; from either end* the service makes train connections on both sides. This voyage takes about 8 hours.

* Recent reports indicate traffic on this ferry route to be heavy and that it serves for light troop-movements. It is also reported that there is only one trip each way per day.

(5) *Supplies.*

(*a*) *Water.* Pusan draws its water supply from the Naktong-gang from which water is piped to a reservoir. Capacity in 1936 was estimated at 9,200 cubic meters per day, and it is probable that the supply has since been increased. Water is piped to all main piers and wharves and can be laid on there or supplied by water-boats in the harbor.

(*b*) *Oil and gasoline.* Prior to 1939 the fairly extensive oil facilities, as well as other dumps of explosive and inflammable material for military and commercial use were scattered throughout the entire area of Pusan. Late in 1939 an ambitious project to concentrate these materials in one region was initiated. The region designated for this purpose was Pubong-mal (Fuhō-matsu) and the reclaimed area immediately to the north. The area south of the basin (Reference ⑫), where oil storage was apparently previously located, has been cleared. The tanks and warehouses for oil storage belonging to the Standard, Korean, California-Texaco, Shell, and Mitsui Oil Companies are all now believed to center around the so-called Oil Basin (Reference ⑪).

TABLE VI - 14

PETROLEUM TANKS AT PUSAN

No. of Tanks	Type	Size	Location
5	Tanks	20′ diameter	E side of Tong-ch'on
5	Tanks	30′ diameter	W side of Tong-ch'on
1	Tank	120′ diameter	SE of N Harbor Breakwaters, near Chosen Heavy Industry (References ⑭ ⑮).
2	Tanks	75′ diameter	Do.
1	Tank	45′ diameter	Do.
2	Tanks	30′ diameter	Do.
3	Tanks	30′ diameter	Do.
2	Tanks	25′ diameter	Do.
3 (prob.)	Tanks	20′ diameter	On inland quayside, Reference ②.

24 tanks

TABLE VI - 14 gives the available data on known oil tank facilities at Pusan. In addition, some warehouses which may be used for the storage of oil and gasoline have been included in Topic 61, G, (3), Storage facilities. There is possible oil storage on the No. 1 Pier (Reference ①), as it is reported that 7 or 8 large fuel storage tanks are partially buried in the side of a mountain, Pokpyong-san (Fukuhei-san), a short distance west of this pier. Oil tankers, docking at No. 2 Pier (Reference ②) unloaded by means of a 4 to 8-inch pipeline running from the pier to these storage tanks.

(*c*) *Coal.* Coal is available at the piers, or it can be delivered by lighters to vessels at anchor. A supply of only about 2,500 tons was maintained during normal times, as storage did not prove financially profitable. Coal stores observed in aerial coverage were located as follows: on the quay at Pusan-jin basin (Reference ⑦), on the Kato-Rice-Refinery Wharf (Reference ⑧), on the Nos. 3 and 4 Quays (References ⑨ and ⑩).

(*d*) *Electricity and gas.* Pusan draws its electricity from 2 steam (thermal plants), one at Yongwol in Kangwon-do (75,000-kilowatt capacity), and one in Pusan (12,000-kilowatt capacity). A gas plant with 4 ovens and 2 storage tanks produces 4,268 consumer units.

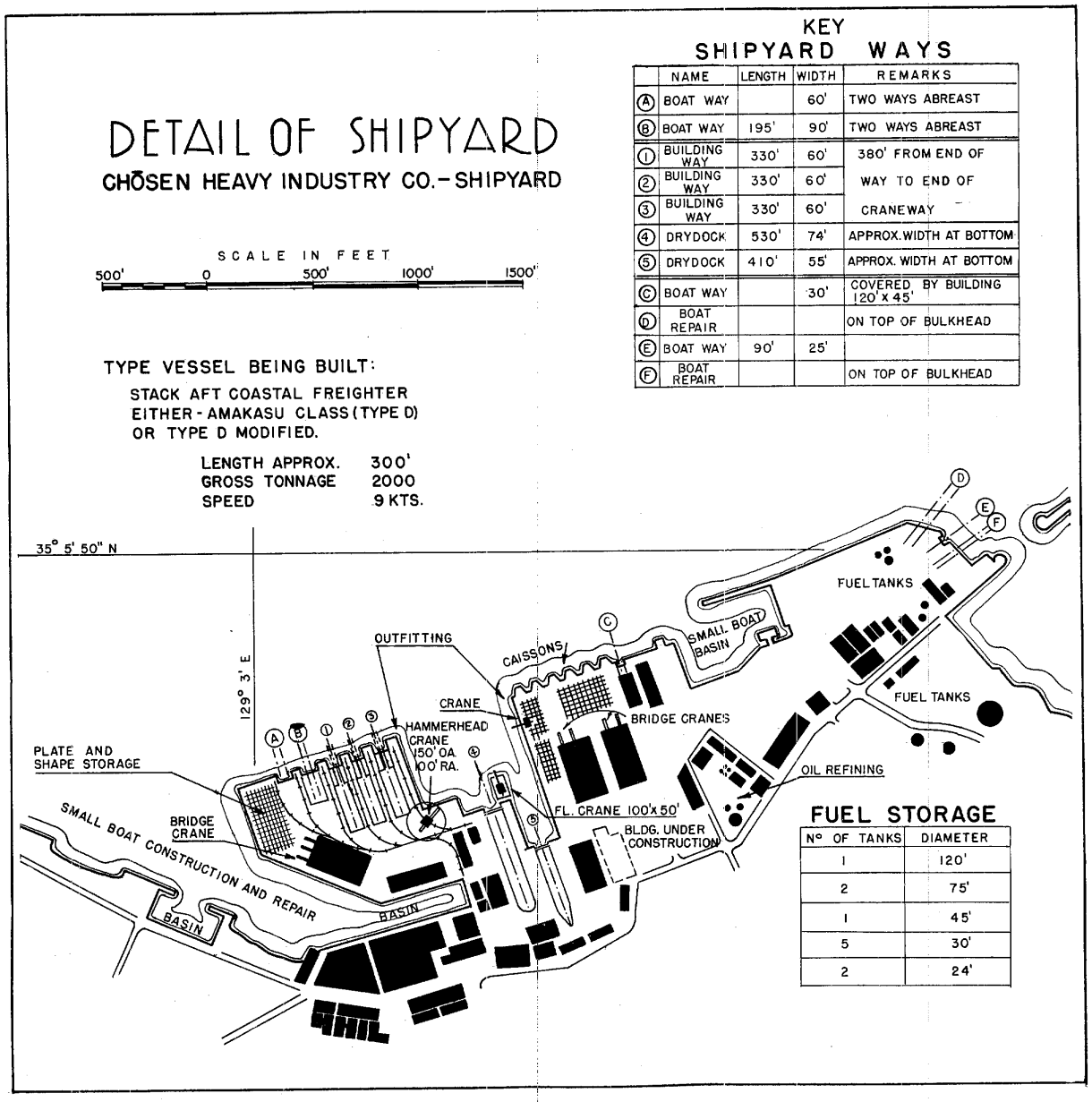

FIGURE VI - 29. *Pusan.*
Plan of Chosen Heavy Industry shipyard (Reference ⑮). Encircled numbers and letters refer to key on this plan only.

(6) ***Repair facilities.***

Three companies, 2 large and 1 small, are engaged in ship and boat construction and repair at Pusan.

The Chōsen Heavy Industry Company (Chōsen Jūkōgyō K.K.), reputed to be the largest shipbuilding concern in Korea, is believed to be capable of building ships of 3,000 tons and of repairing vessels of 8,000 tons. The company, owned by Mitsubishi and Totaku interests, has been considerably expanded since 1938. Although no available source definitely locates this concern, it is in all probability at the northwest corner of Mok-to (Reference ⑮).

Facilities for building and repair maintained by the Chōsen Heavy Industry Company are indicated on the detailed plan of this yard (FIGURE VI - 29).

The Pusan Diesel Engine Company had a shipyard under construction in 1940, which is now reported in operation. Not located by any available source, it may be at the small boat repair basin on the south side of Reference ⑫. It is believed that this facility is engaged only in repair.

The Takehashi (or Tanaka) Shipbuilding Yard is reported to be on Mok-to, Taesin-mal. A port of the facilities there are a 253-foot drydock, handling vessels up to 1,500 tons, and another larger drydock reported under construction near the Standard Oil Company's godowns, southwest of the Pusan drawbridge.

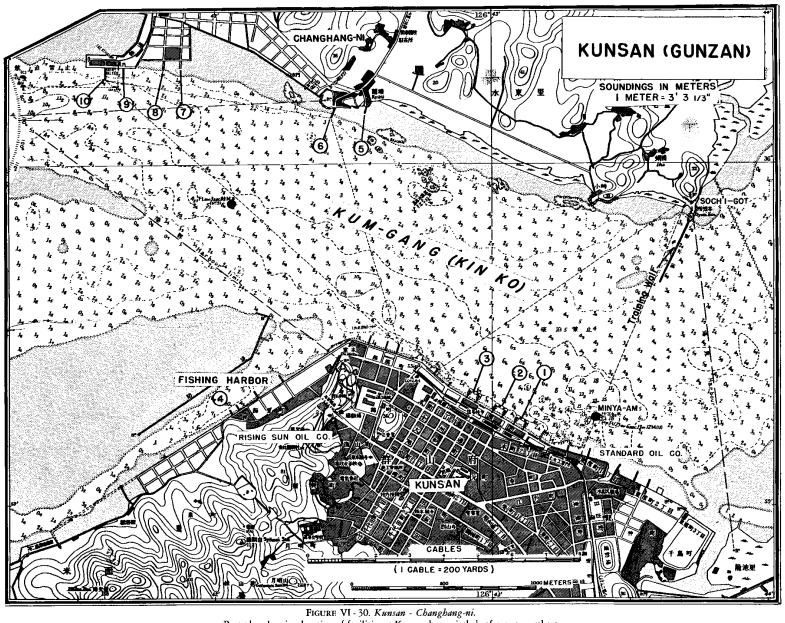

FIGURE VI - 30. *Kunsan - Changhang-ni.*
Port plan showing location of facilities at Kunsan by encircled reference numbers.

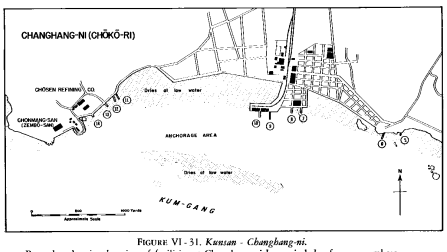

FIGURE VI - 31. *Kunsan - Changhang-ni.*
Port plan showing location of facilities at Changhang-ni by encircled reference numbers.

A marine railway is on the Industrial Mole (Reference ⑬). The ramp measures approximately 60 feet wide and 240 feet long.

H. Kunsan (Gunzan) - Changhang-ni (Chōkō-ri). (35°59′N, 126°42′E)

Kunsan (Gunzan) and Changhang-ni (Chōkō-ri) are in southwest Korea on the Kum-gang estuary about 12 miles from the sea (PLAN 25). Kunsan is on the south bank of the estuary and Changhang-ni is on the north bank.

Kunsan is one of the leading export centers for the agricultural products of southwest Korea; in 1935, 9,920,000 bushels of wheat were exported. Principal imports were coal, iron, iron products, salt and tobacco. Recently factories making diesel motor parts, mining machinery, small steel ships, and ammunition have been established in and near Kunsan.

Changhang-ni has been developed within the past 10 years, mainly to handle the requirements of the Chōsen Refining Co., which produces copper and other nonferrous metals. The estimated output of copper in 1943 was 11,000 tons, a large proportion of which was probably exported.

Vessels drawing more than 8 feet can enter the Kunsan - Changhang-ni harbor only at high tide; least entrance depths at neap high water are about 20 feet. Small islands, drying rocks, shoals, and mud flats lie on both sides of the entrance channel. About 11 third-class anchorage berths are available in the harbor; 8 of the berths are near Kunsan and 3 are near Changhang-ni. Large ships anchor and unload at the entrance to the estuary. At Kunsan there is about 750 feet of wharfage in 18 to 22 feet of water. At Changhang-ni 1 pier has a 50-foot face in about 18 feet of water. The estimated unloading capacity is 1,200 long tons per day alongside the Kunsan facilities. Only a small amount of cargo can be unloaded in the stream.

A railroad and primary highway can clear cargo southward and eastward from Kunsan. A railroad and an improved road can clear cargo northeastward from Changhang-ni.

(1) *Harbor.*

Kunsan and Changhang-ni harbors consist of a stretch of the Kum-gang (river) (FIGURES VI - 30 and VI - 31). Kunsan is on the south bank of the river about 12 miles from the entrance to the Kum-gang estuary; Changhang-ni is on the north bank about 1 mile downstream from Kunsan.

Within the Kunsan harbor administrative limit lines, which include part of the Changhang-ni waterfront, there is an area of about 900 acres. Most of this area has low-water depths of less than 15 feet, averaging about 9 feet. However, a deep-water channel from 100 to 500 yards wide runs close off the Kunsan waterfront and then crosses the river northwestward to Changhang-ni. General depths in the channel are over 24 feet; least depths are about 17 feet, and greatest depths about 40 feet. This deep-water channel can provide anchorage berths for deep-draft vessels at any state of the tide, but can be reached only at high tide. The rest of the general harbor area, and the artificially protected Fishing Harbor on the northwest side of Kunsan are open to deep-draft traffic at high tide only.

A 400-yard-long training wall, which projects from Soch'i-got on the north bank of the river, helps to prevent silting in the harbor area.

(*a*) *Entrance channel.* Kunsan and Changhang-ni are approached from the Yellow Sea through the southern channel of the Kum-gang. The northern channel, separated from the southern one by a large shoal in the middle of the river mouth, has many mud flats and shallows and is navigable only by small craft with local knowledge. The beginning of the southern channel, which is about one-half mile wide, is just west of Piung-do (Hiyō-tō) (island) in Kunsan-hang (bay). The channel was marked by buoys and beacons.

Small islands, drying rocks, shoals and mud flats lie along both sides of the southern channel, and the inner part of the channel at low tide is narrow and tortuous. Unless extensive dredging has taken place since 1938, a ship drawing more than about 8 feet can reach Kunsan - Changhang-ni harbor only at high tide; least entrance depths at neap high water are about 20 feet.

(*b*) *Anchorage.* About 11 third-class anchorage berths are available in the deep-water channel, between Minya-am, which is near the eastern end of the Kunsan waterfront, and Chonmang-san (Zembo-san), which is near the western end of Changhang-ni. Eight of the berths are near Kunsan, and 3 are near Changhang-ni.

The many changes in depths, the great tidal range, and the strong currents make anchoring difficult, and necessitate care in securing. Vessels usually moor bow and stern.

Large ships anchor and unload in an area about 2½ miles long at the entrance to the estuary, between Changsan-do (Chōsan-to, Chosan I.) and Orang-do (Gorō-tō, Youjiku I.).

(*c*) *Significant hydrographic features.* The mean high water interval is 3 hours; springs rise 20.3 feet; neaps 12.4 feet.

In the anchorage off Kunsan the flood stream runs for 5½ hours with a maximum rate of about 2¼ knots, and the ebb stream runs for 6½ hours with a maximum rate of 3½ knots. Slack water occurs for about 15 minutes. Off the center of Changhang-ni the flood stream attains a rate of about 3 knots. For several days after a freshet the ebb stream may run at double its usual rate for a longer period, while the flood stream runs for a correspondingly shorter period.

(*d*) *Local weather.* The yearly average temperature is 53.9°F., with the lowest temperature, 28.9°F., occurring in January, and the highest, 85°F., occurring in August. Rainfall is heaviest in late spring and early fall, with a yearly total average of 32.3 inches. Snowfall, beginning in November and ending in March, is generally light—20 days per year is the average number of days with snowfall.

The river does not freeze over, and although pieces of ice occasionally float down from upstream they are quickly melted. Fog, sometimes lasting for several days, is most prevalent during June and July, the period of southerly winds.

Strong winds blow from the north and northwest during winter, while lighter winds blow from the south during summer. During the periods of spring tides, winds are often strong, although generally the winds within the harbor are weak, and gales over 22 m.p.h. are very infrequent.

Loading and unloading are sometimes hindered by waves caused by northwest winds—there are about 30 days in a year when it is impossible to load and unload in the offing, and about 10 days a year when it is impossible in the harbor.

(2) *Landing facilities.*

At Kunsan the only landing facilities for deep-draft vessels are 3 pontoon piers (References ①②③)* each capable of accommodating a 3,000-ton ship. There are also 19 piers for fishing boats and other small craft. Five of the small-craft piers are in the artificially protected Fishing Harbor on the northwest side of Kunsan. A protective wall has been built along the whole Kunsan waterfront.

At Changhang-ni the main landing facility is a roughly L-shaped mole which extends about 350 yards from the shore, and which has 4 small piers (References ⑦⑧⑨⑩) projecting from it. Two more piers (References⑤⑥) are about ¾ mile east of the main facility, and a group of 4 piers (References ⑪⑫⑬⑭) are about 1 mile west. Unless dredging near shore has been carried out since 1938 the only Changhang-ni piers which do not dry at low water are the 2 eastern piers (References ⑤⑥) and 2 of the piers (References ⑨⑩) on the main facility. Reference ⑩ can even be used by the deep-draft vessels.

Harbor craft in 1940 included 63 small boats with total capacity of 3,910 tons and 6 tow-boats with total capacity of 190 tons. There were also one ferry boat, and a large number of fishing boats. Many of the local craft are sail boats and sampans.

(*a*) *Deep-draft landing facilities.* At Kunsan the 3 pontoon piers (References ①②③) are each constructed of 5 reinforced concrete pontoons with wooden decks connected by gangways and moored off the bulkhead. Three pontoons form the face of each pier and the other 2 pontoons lie inshore on both sides. Ramps connect both ends of each pier with the bulkhead. The piers are served by 3 transit sheds which face the piers, and by considerable open storage space and many small warehouses nearby. Two railroad spurs and a wide road run behind the transit sheds, at about 75 yards from the waterfront; another road runs immediately along the waterfront. One hand-operated stationary 33-ton crane serves the 3 piers. Lighting for night handling was planned in 1937, but it is not known whether it has been installed.

At Changhang-ni the deep-draft pier (Reference ⑩) is served by 2 transit sheds close behind the pier, and by a railroad spur which runs behind the transit sheds. Road exit is also available. No data are available on construction, cranage and lighting.

Pontoon pier No. 1 (Reference ①); details follow:

Location:	Easternmost of 3 pontoon piers at Kunsan.		
Operated by:	Customs office.		
Purpose:	General cargo.		
	Face	E side	W side
Length:	260′	120′	120′
Depth alongside:	About 18′.		
Berthage:	260′.		

Pontoon pier No. 2 (Reference ②); details follow:

Location:	Central pier of 3 pontoon piers at Kunsan.		
Operated by:	Customs office.		
Purpose:	General cargo.		
	Face	E side	W side
Length:	260′	120′	120′
Depth alongside:	21′		
Berthage:	260′		

* References are encircled numbers on FIGURES VI - 30 and VI - 31.

Pontoon pier No. 3 (Reference ③); details follow:

Location:	Westernmost of 3 pontoon piers at Kunsan.		
Operated by:	Customs office.		
Purpose:	General cargo.		
	Face	E side	W side
Length:	260′	120′	120′
Depth alongside:	22′		
Berthage:	246′		

Changhang-ni deep-draft pier (Reference ⑩); details follow:

Location:	Westernmost of piers on mole at Changhang-ni.		
Purpose:	General cargo (mainly lighters).		
	Face	E side	W side
Length:	About 50′	About 200′	About 200′
Depth alongside:	About 18′	About 6′	About 6′

(*b*) *Miscellaneous landing facilities.* Kunsan has 19 small piers which are used by fishing boats and harbor craft. The piers are from about 100 to 200 feet long. Of the 19, nine are east of the 3 pontoon piers (one of the nine is just beyond the port plan boundary); 5 are in the main harbor west of the pontoon piers; and 5 are southwest of the city in the Fishing Harbor (Reference ④)—one of this five projects from the breakwater and may be merely a training wall. The 9 eastern piers probably dry at low water; the other piers probably have shallow depths.

Changhang-ni has 9 small piers (References ⑤ through ⑨ and ⑪ through ⑭). The 2 eastern piers (References ⑤⑥) are mainly used by fishing boats; the piers on the mole (References ⑤⑥⑦) handle most of the lighter traffic; the 4 western piers (References ⑪⑫⑬⑭) handle traffic to and from the Chōsen Refining Co. plant. The piers are from about 100 to 200 feet long. Unless near shore dredging has been done since 1938, Reference ⑥ with 3 feet of water at its head, and Reference ⑨ with 7 feet are the only miscellanous landing facilities at Changhang-ni which do not dry at low water.

(3) *Storage facilities.*

(*a*) *Storage warehouses.* At Kunsan 3 single-story transit sheds of stone construction with galvanized roofs, having a total ground space of 132,300 square feet, face the 3 pontoon piers. The sheds are used mainly for storing wheat. The area behind the piers contains many small warehouses of wood and stone construction, and these, as well as the sheds, are served by 2 parallel railway spurs which connect with the railroad running inland from Kunsan.

At Changhang-ni 2 transit sheds, one 240 by 150 feet, the other 260 by 150 feet are on the mole behind the deep-draft pier (Reference ⑩). Several other warehouses are on or near the mole. These warehouses and the 2 transit sheds are served by a railroad spur. The Chōsen Refining Co., at the west end of Changhang-ni, probably has some storage buildings.

(*b*) *Supply dumps.* A large outdoor storage area of 202,230 square feet used principally for rice storage, is about 300 yards west of the pontoon piers at Kunsan. The 2 railroad spurs and waterfront thoroughfare, 36 to 65 feet wide, running to the storage area, facilitate direct loading and unloading.

(4) *Capacity and clearance.*

(*a*) *Actual annual traffic.* In 1935, the only year for which figures are obtainable, Kunsan handled 887,098 tons of cargo. In 1936, 915 steamships, with an aggregate tonnage of

788,399 tons, following sea routes to and from Shanghai, Dairen, and Japan proper, made Kunsan a port of call. In the same year small boats with total tonnage of 918,042 tons, used the port facilities.

The only sizable traffic carried on at Changhang-ni is the export of nonferrous metals by the Chōsen Refining Co. The probable amount of copper refined in 1943 was 11,000 tons and a large proportion of this was probably exported.

(*b*) *Estimated unloading capacity.* The 3 pontoon piers at Kunsan have an estimated unloading capacity of 1,200 long tons per day. Only a small amount of cargo can be unloaded in the stream.

(*c*) *Facilities for clearing port.* From Kunsan a standard-gauge line runs to I-ri, 14 miles southeast, from where lines lead south to Mokp'o, southeast to Yosu, and northeast to Taejon on the main Pusan - Kyongsong - Mukden line.

From Kunsan one primary highway and several unimproved roads run inland, where they intersect south and northbound highways.

From Changhang-ni a standard-gauge railroad and an improved road lead northeastward to Ch'onan on the main Pusan - Kyongsong - Mukden line.

Road exits are probably available from all the facilities. The 3 pontoon piers at Kunsan (References ①②③), and 2 of the piers on the mole at Changhang-ni (References ⑨⑩) are served by railroad spurs.

The river is navigable for 76 miles upstream by motor launches from Kunsan at high tide but only by very small craft at low tide.

(5) *Supplies.*

(*a*) *Water.* Fresh water is supplied by a reservoir 10 miles south of Kunsan. One water-boat capable of supplying water at 175 tons per hour and 2 water-boats with 30-ton capacity pumps are available. Water can be supplied to ships both at Kunsan and at Changhang-ni.

(*b*) *Oil and gasoline.* Only small amounts of oil and gasoline were reported on hand before the war. Fuel oil was obtainable from the Standard Oil Company and Rising Sun Oil Company; Standard Oil stored about 10,000 cans of heavy oil and gasoline, and Rising Sun about 5,000 cans of petroleum, including heavy oil. Rising Sun owns one 60-ton and one 4-ton oil tank; and the Rinken Oil Company owns one 152-ton oil tank. Gasoline is reportedly stored in 5-gallon tin cans for immediate distribution.

(*c*) *Coal.* The stock has been very small, reportedly not exceeding 600 tons at one time. A number of coaling lighters has been available for coaling vessels in port.

(*d*) *Electricity.* The main supply of electric power is furnished by a large hydroelectric plant located near Chonju via a transformer station at I-ri, 14 miles away. Kunsan itself has a small steam-generated electric plant opposite the Kunsan railroad station on the highway to I-ri.

(6) *Repair facilities.*

(*a*) *Marine railways.* Five marine railways located at the Customs Quay carry out repairs for wooden ships. Details are summarized in TABLE VI - 15.

TABLE VI - 15
MARINE RAILWAYS AT KUNSAN

	CAPACITY (TONS)	LENGTH (FT.)	WIDTH (FT.)
No. 1	140	165	50
No. 2	140	165	40
No. 3	120	165	65
No. 4	120	165	40
No. 5	100	165	40

(*b*) *Marine repair plants.* The Chōsen Metal Company has been engaged in the construction of small steel ships, and 2 foundries at Kunsan made and repaired small vessels before 1941, but details of capacity are not known.

I. Inch'on (Jinsen).
(37°28'N, 126°37'E)

Inch'on (Jinsen) is at about the middle of the west coast of Korea, on the estuary of the Yom-ha (En-ka) (river), a distributary of the Han-gang (river) (PLAN 28). It has a well protected natural harbor and is ice-free all the year. However, the 30-foot tidal range is a great disadvantage.

Inch'on is the port of the Korean capital, Kyongsong, about 25 miles inland, with which it has good rail and road connections; it also serves the rapidly expanding industries in its own vicinity. It is the fourth largest Korean city and its industries produce railroad rolling-stock and equipment, machinery and steel. Ordnance and ammunition are probably also produced.

A tidal basin with lock-gates provides about 4,000 feet of wharfage in depths of over 27 feet, and is the only landing facility for deep-draft vessels; it can accommodate five 450-foot vessels drawing 27 feet (*Note: entrance lock is 430 feet long and 60 feet wide.*) Almost all the small-craft facilities and most of the inner harbor dry at low water.

Unlimited anchorage is available in the channel of the Yom-ha estuary, a section of which forms the outer harbor. Within the outer harbor, which is about 2 miles from the tidal basin, are about 16 first-, 6 second-, and 7 third-class anchorage berths. Farther downstream (southward) the mile-wide channel provides good anchorage in depths of 5½ to 10 fathoms for a distance of about 5 miles.

The estimated unloading capacity for general cargo is 15,500 long tons per day, of which 3,000 tons is worked at vessel berths in the tidal basin, and 12,500 tons discharged at anchor into lighters.

(1) *Harbor.*

Inch'on has an inner and an outer harbor (FIGURE VI - 32). The outer harbor is west of Wolmi-do and Sowolmi-do (islands) and their connecting causeways. It consists of a section of the Yom-ha estuary, which flows between extensive tidal mud flats and at low tide is about 1 mile wide and from 6 to 8 fathoms deep. Outer harbor is the anchorage for large vessels. Within the harbor administrative limit is a water area of approximately 3,800 acres.

The inner harbor is protected by the islands and causeways from the north and west, and by a long breakwater from the south. The greater part of the inner harbor dries at low water leaving only a narrow dredged fairway about 12 to 13 feet deep in mid-channel. Silting is rapid and dredges are in constant operation.

To counteract the great tidal range, a tidal basin (Reference ④)* for deep-draft vessels has been constructed at the southeastern end of the inner harbor. It is reached through the fairway.

Parallel to the present tidal basin, the construction of a new basin (Reference ①) was started in 1936 but has not been completed.

(*a*) *Entrance channel.* The river mouth is fringed by the Marie Fortunee and the Tokchok-kondo (Tokuseki) island groups. South of these is the main or southern entrance channel, which is 50 miles long and from 6 to 10 fathoms deep. Another waterway approaches Inch'on from the north, but it is navigable only at high tide by shallow-draft vessels.

Vessels using the main or southern entrance channel usually passed southward of Miktok-to Light, and then followed Tong-sudo (Higashi-suidō, East Channel), in which tidal currents never exceed 4 knots. Currents in the alternative So-sudo (Nishi-suidō, Flying Fish Channel) are stronger. Numerous shoals are in the channels. Tong-sudo (East Channel) was lighter for night navigation. (U.S.H.O. charts 1383 and 3237).

(*b*) *Anchorage.* Unlimited anchorage is available in the channel of the Yom-ha estuary, a section of which forms the outer harbor. Within the outer harbor, which is about 2 miles from the tidal basin and the other landing facilities, are about 16 first-, 6 second-, and 7 third-class anchorage berths. Farther downstream (southward) the mile-wide estuary channel provides good anchorage in depths of 5½ to 10 fathoms for a distance of about 5 miles.

The outer harbor is well protected at all times, is free of ice, and the tidal currents are not too strong. However, a strong southerly wind raises some sea, which makes the working of cargo in the stream difficult.

Vessels which are too large to enter the inner harbor and tidal basin usually work their cargo in the outer harbor southwestward of Wolmi-do, where there is good holding ground of mud and sand, and where the tidal currents are weak. Above Wolmi-do, the holding ground is poor with a rock bottom. Caution is necessary off So-wolmi-do owing to the scattered iron plates of sunken vessels.

(*c*) *Significant hydrographic features.* The mean high water interval is 4 hours and 32 minutes. The high water springs rise to 28½ feet; neaps 21¼ feet; and the mean sea level, 15½ feet. The tidal range is one of the highest along the entire western coast of Korea.

In the inner harbor the breakwaters weaken the tidal flow which does not exceed one knot. In the river the flood tide flows northward towards the west side of Wolmi-do; the ebb tide sets in the opposite direction. The turns occur about 30 minutes after high and low water stand. The greatest velocity is 3.8 knots; for about 15 minutes at the turns the velocity of the current is 0.3 knots or less.

(*d*) *Local weather.* Temperatures in winter at Inch'on are rather low with a January mean of 26° F. In summer, temperatures are moderate with a mean temperature of 79° F. in August. The absolute extremes range between minus 6° F. and 98° F. Minimum daily temperatures below freezing are common during the winter months from December through March when 18 to 30 days a month show such minima.

As a result of cyclonic activity and the 2 monsoon periods, precipitation shows a fairly well developed variation with a mean maximum of 8.4 inches in July and a mean minimum of 0.6 inches in March. The mean annual rainfall is 38.4 inches with 65% of the total falling during the months of June through September.

Cloudiness is most prevalent from April through August with monthly means of from 11 to 19 cloudy days. July has the maximum cloudy days. Fog occurs with greatest frequency in summer with a mean of 6 to 10 foggy days a month from May through July. During the remainder of the year, fog normally occurs on 2 to 3 days a month. October and November appear to have the best ceilings and visibilities. In winter (during the land monsoon) visibilities should be reasonably good owing to the low level instability with the exception of periods of snowfall. In summer (the period of the sea monsoon) the number of days with impaired visibilities should be greatest.

The prevailing winds in the winter are from the northerly quadrant. In summer southerly winds prevail. The mountain ranges to the north and west provide a sheltering effect. In summer and autumn gales are very rare; in winter and spring there is an occasional gale from the west or northwest, and wind velocities above 16 knots are frequent.

(2) *Landing facilities.*

The only landing facilities for deep-draft vessels are in the tidal basin (Reference ④), where five 4,500-ton vessels can work cargo alongside simultaneously. Extensive shore facilities for small craft and lighters are both within the inner harbor and north of the Wolmi-do causeway.

Two 1½-ton stiff-leg derricks and possibly 2 traveling cranes are in the tidal basin, and one 3-ton and one 10-ton stationary manual cranes are reportedly in the inner harbor (locations unknown). A coal unloader serves the Railroad Coaling Quay (Reference ⑬). There are also one 30-ton floating crane (28 by 70 feet) and one 12-ton floating crane (34 by 80 feet); the 30-ton crane is probably always kept in the tidal basin.

In 1936 the following harbor craft were available in the harbor: 244 lighters with an aggregate tonnage of 12,720 tons varying in size from 9- to 140-ton craft, one 94-ton tugboat, two 35-ton tugboats, one 18-ton tugboat. There were also twenty 30-ton coal lighters available. In the tabular descriptions of landing facilities only the nearest warehouses have been mentioned. Details of these and of more distant warehouses are listed in TABLE VI - 16.

(*a*) *Tidal basin* (Reference ④). The tidal basin covers an area of 119,000 square yards (FIGURES VI - 33, VI - 34, and VI - 35). It is equipped with a pair of "double leaf" lock gates, which are controlled by electricity and which enclose a lock 430 feet long by 60 feet wide. The lock walls are 50 feet high. At the seaward entrance to the lock, two 350-foot outward-curving fending-piers guide and insure safe passage for vessels into the tidal basin. The piers are 15 feet wide and 50 feet high.

Although the lock and tidal basin were constructed to serve 4,500-ton ships as the standard vessels, larger vessels can proceed with extreme caution through the lock to the wharves. Vessels of more than a 12-foot draft can reach the basin only at high tide.

* References are encircled numbers on FIGURE VI - 32.

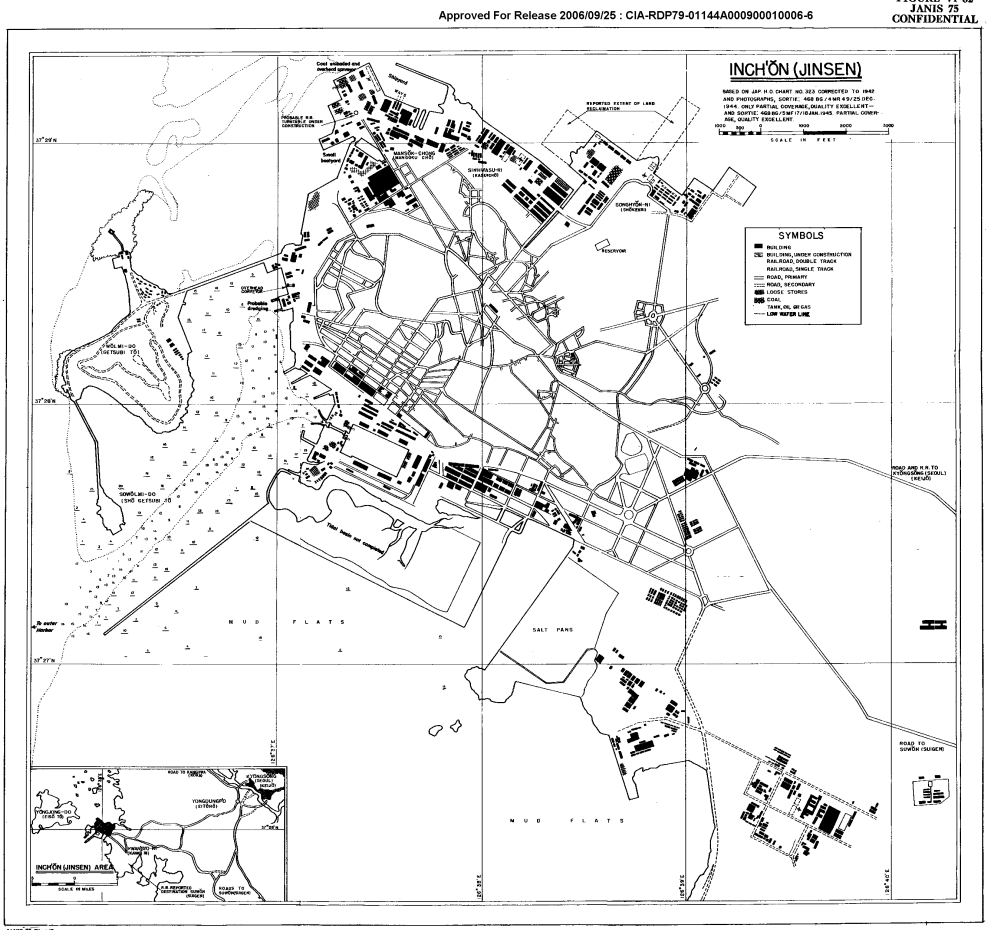

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FIGURE VI - 32. *Inch'on.*
Port plan showing location of facilities by encircled reference numbers.

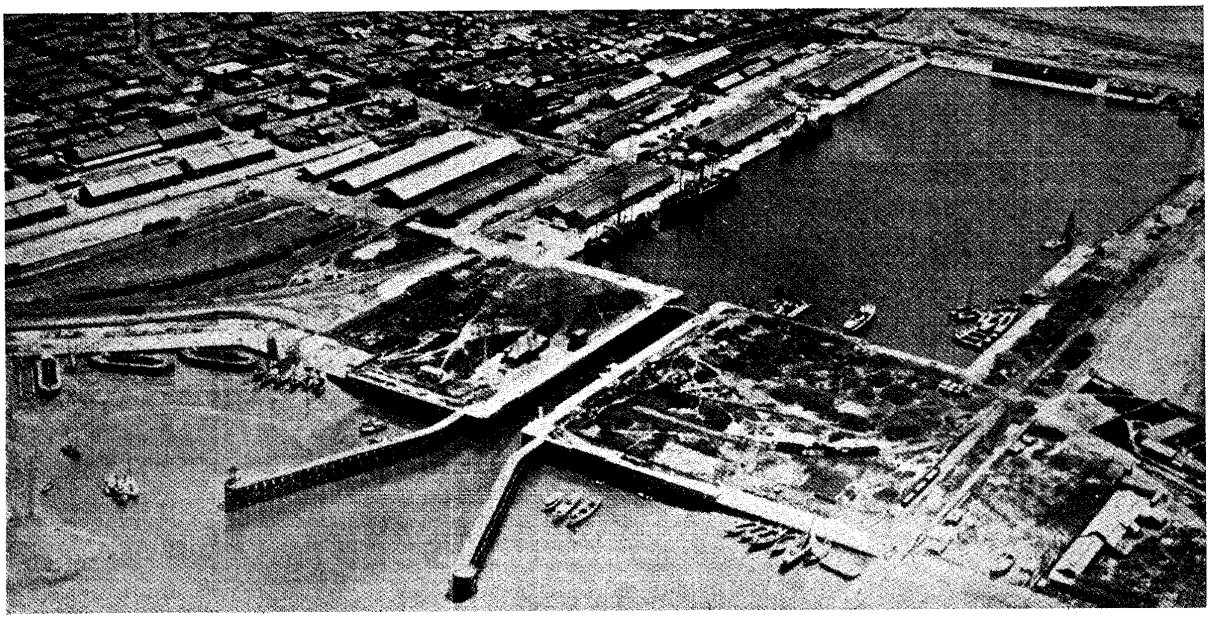

FIGURE VI - 33. *Inch'on.*
Tidal basin (Reference ④), looking eastward. Before 1930.

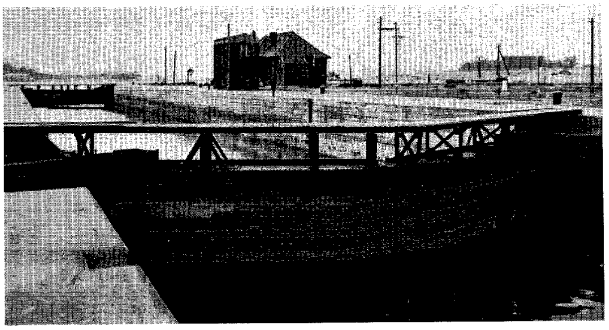

FIGURE VI - 34. *Inch'on.*
Tidal basin (Reference ④) lock gates, looking north-northwestward. Before 1932.

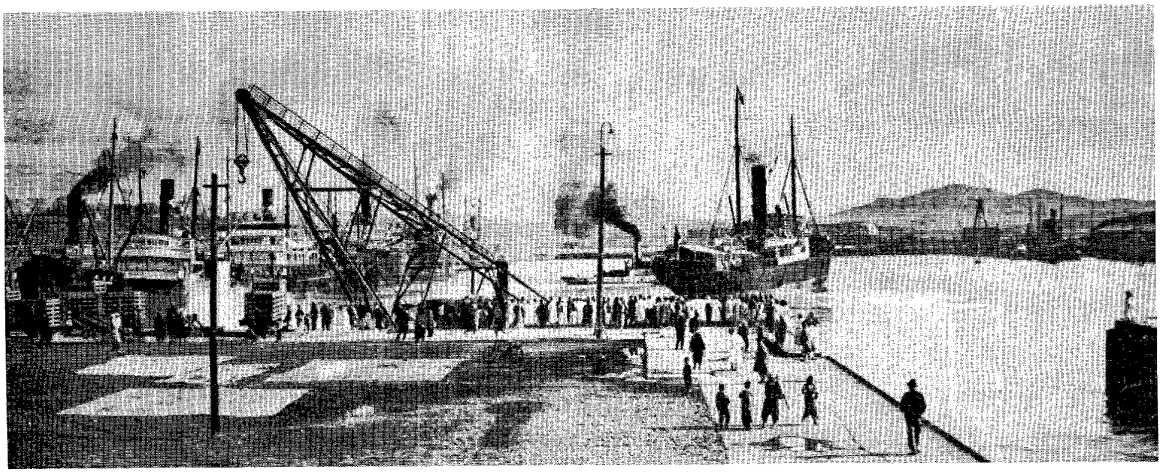

FIGURE VI - 35. *Inch'on.*
Northwest sides of tidal basin (Reference ④), looking east-southeastward, showing 30-ton floating crane.

Within the basin, depths of 27 to 35 feet are maintained. Large vessel berths are available at the wharves on the north and south sides of the basin.

A new tidal basin for 10,000-ton vessels (Reference ①), six times as large as the old dock, has been under construction since 1936. It is just south and parallel to the old basin. Groins to delimit the basin are visible in aerial photographs; however, according to a prisoner-of-war interrogation, construction has been stopped on this project due to the critical shortage of manpower and materials.

Tidal basin (Reference ④); details follow:

Location:	SE section of inner harbor.			
Operated by:	Korea Governor General (Inch'on Customs House).			
Purpose:	General cargo.			
Construction:	N side (large vessels) stone marginal wharf. S side (large vessels) steel-reinforced projecting wharf. E and W sides (for small craft) stone sloping gravity wall.			
Depth:	27′ to 35′.			
	N side	S side	E side	W side
Length:	1500′	1200′ +300′	700′	410′ +260′
Width of apron:	45′	65′	open	open
Berthage:	N side, three 450-foot vessels drawing 27′. S side, two 450-foot vessels drawing 27′. Note: lock at entrance to basin is only 430′ long by 60′ wide.			
Storage facilities:	N side—2 warehouses 120′ by 300′ 1 warehouse 110′ by 165′ S side—2 warehouses 96′ by 360′ Open stores on E and W sides.			
Cranage:	W side—two 1½-ton stiff-leg derricks. N side—possibly two traveling cranes. One 30-ton floating crane (28′ by 70′) probably always kept in tidal basin.			
RR:	N side—2 RR spurs leading to RR station and waterfront area N of basin. S side—1 RR spur runs past E side of basin and joins above spurs.			
Estimated unloading capacity:	3,000 long tons per day.			

(*b*) *Small craft facilities.* The entire waterfront, including the inner harbor and the newly constructed area north of the Wolmi-do causeway is quayed for a length of 16,000 feet.

The inner harbor is bulkheaded for a length of approximately 6,000 feet, 3,300 feet of which is constructed of a stone sloping gravity wall for use of lighters at any stage of the tide above low water. The inner harbor also contains 6 ramp-piers (References ②⑤⑥⑦, and the twin piers of ⑧), which are sloped for use at any stage of the tide above low water (FIGURE VI - 36).

North of the Wolmi-do causeway, as a result of the extensive industrial expansion program, the shore has been bulkheaded for an approximate length of 10,000 feet. Case oil, coal, and industrial quays have been constructed. The entire bulkheaded shore dries alongside at low water.

South Basin Ramp-pier (Reference ②); details follow:

Location:	SE corner of inner harbor, near entrance to uncompleted tidal basin (Reference ①).
Construction:	Possibly stone.
Length:	325′ (15′ wide).
Depth alongside:	Dries at low water.
Roads:	Road exit only.
Remarks:	Formerly an independent pier, but now joined to groin which encircles uncompleted tidal basin (Reference ①).

L-shaped Pier (Reference ③); details follow:

Location:	S of tidal basin entrance.
Construction:	Stone with sloping sides.
Length:	S side, 370′; W side, 190′; (top width, 20′).
Depth alongside:	Dries at low water.
RR and roads:	Road exit; RR track about 300′ behind root of pier.
Remarks:	Boat basin between L-shaped pier and S fending-pier of tidal basin; quayed length, 470′; 36 small craft in basin (Dec. 1944 sortie).

North Basin Ramp-pier (Reference ⑤); details follow:

Location:	N of tidal basin.
Construction:	Possibly stone.
Length:	NW side, 480′; SE side, 360′; Face, 20′.
Depth alongside:	Dries at low water.
RR and roads:	RR spur 150′ to rear; road parallels shore line.
Remarks:	Boat basin between pier and N dock fending-pier with quayed length 640′; over 15 small craft in basin and one floating crane (34′ by 80′). (Dec. 1944 sortie).

Customs Ramp-pier No. 2 (Reference ⑥); details follow:

Location:	E shore of inner harbor.
Construction:	Wood deck on ferro-concrete piles.
Length:	Length 610′ (width 25′).
Depth alongside:	Dries at low water.
Storage facilities:	4 one-story sheds to rear of pier (FIGURE VI - 37).
RR and roads:	RR spur 300′ to rear; road leads to pier.
Remarks:	650′ quay SE of pier.

(Continued on Page VI - 44)

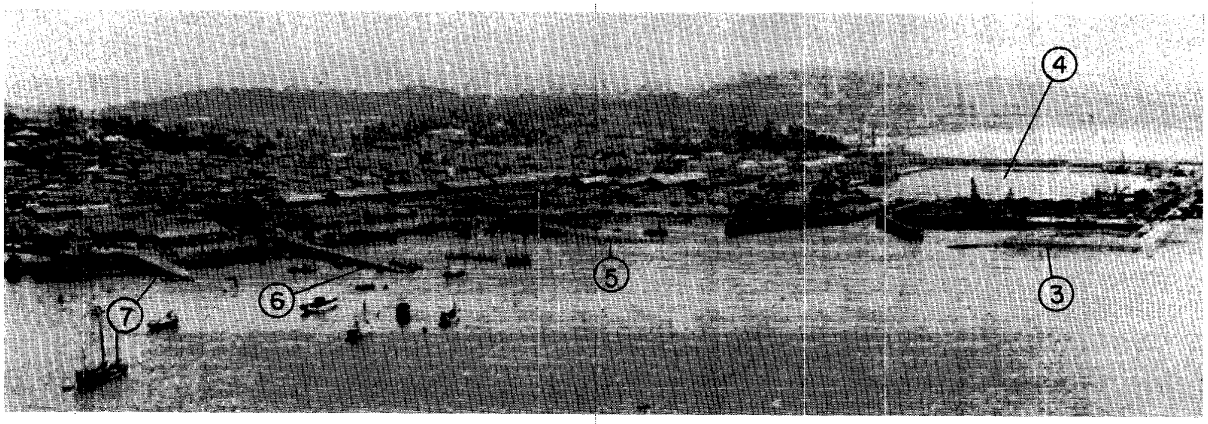

FIGURE VI - 36. *Inch'on.*
Piers near entrance to tidal basin, looking eastward. Before 1935.

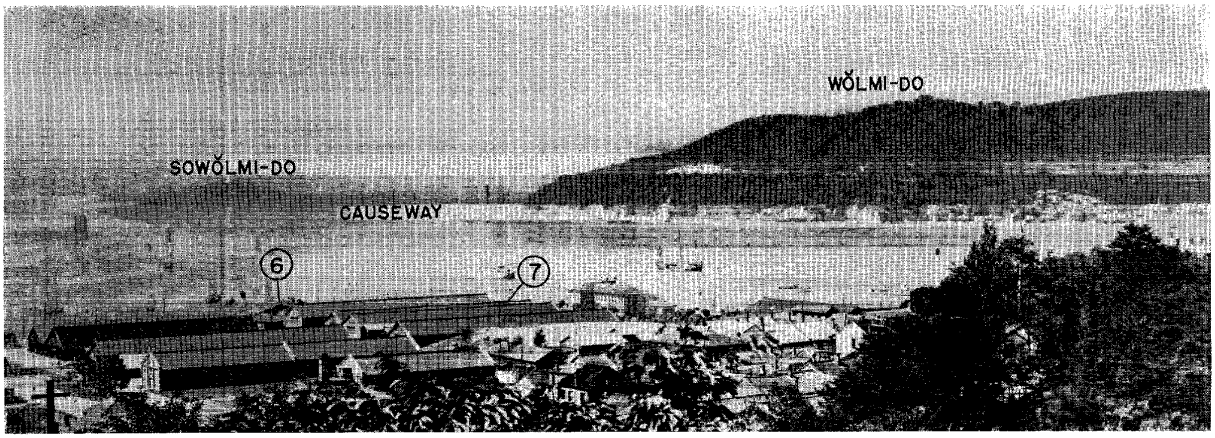

FIGURE VI - 37. *Inch'on.*
Warehouses behind Customs Ramp-piers (References ⑥⑦), looking west-southwestward across harbor.

TABLE VI - 16
WAREHOUSES AT INCH'ON

Reference on Figure VI - 32	Location	Number of Warehouses	Length (Ft.)	Width (Ft.)	Total Ground Area (Sq. Ft.)	Remarks
④	On N wharf of tidal basin	3	(2) 300	120	72,000	Used for storage of general cargo discharged from vessels alongside. RR spur to rear of buildings.
			165	110	18,150	
④	Inland of N wharf	6	495	55	27,225	Largest of a group of 14 buildings on the N side of basin; 3 RR spurs serve area; one-story buildings.
			300	40	12,000	
			(2) 233	75	34,950	
			190	48	9,120	
			260	40	10,400	
④	E quay of tidal basin	3	300	150	45,000	Largest of six buildings in area; 2 RR spurs in area; open storage area on E and W quays.
			(2) 300	100	60,000	
④	S wharf of tidal basin	2	360	96	69,120	Used for discharge of general cargo from vessels alongside; 1 RR spur to rear.
⑥ and ⑦	Behind Ramp-piers No. 1 and No. 2	4	180	30	5,400	These are situated near quay.
			220	50	11,000	
			180	120	21,600	
			220	60	13,200	
		2	220	115	25,300	RR runs by these which are directly behind above warehouses.
			220	60	13,200	
⑧	On mole, S of causeway	1	180	85	15,300	
⑧	N of mole	2	140	45	12,600	
⑨	E shore of Wolmi-do	9	(2) 75	35	5,250	Formerly owned by SVO. First 7 buildings are case oil godowns.
			(3) 100	36	10,800	
			(2) 100	80	16,000	
			24	15	360	Gasoline godown.
			100	22	2,200	Open shed.
⑩	E end of Wolmi-do causeway	3	85	30	2,550	Oil tank in vicinity.
⑩ and ⑪	NW of Reference ⑩	6	250	42	10,500	
			(3) 150	42	37,800	
			100	42	4,200	
			110	55	6,050	
⑪	S of open stores quay	4	(2) 150	42	12,600	Loose stores on quay appear to have no relationship with this warehouse area.
			110	55	6,050	
			85	55	4,675	
⑮	On reclaimed land of probable Tōkyō Shibaura Electric Co.	4	400	200	80,000	4 of 23 buildings in vicinity. Power plant located in area.
			350	100	35,000	
			300	100	30,000	
			400	150	60,000	
⑮	On newly reclaimed land to NE of Reference ⑮	10	100	55	55,000	Probable retaining wall along waterfront. RR spur to SE of area.
⑮	New industrial area, about 2,000′ E of Reference ⑮	14	140	40	78,400	Probable retaining wall to N of warehouses. Road exits.
	Totals	73			933,000	

(Continued from Page VI - 42)

Customs Ramp-pier No. 1 (Reference ⑦); details follow:

Location:	E shore of inner harbor.
Construction:	Wood deck on steel piles.
Length:	Length, 370′ (width, 35′).
Depth alongside:	Dries at low water.
Storage facilities:	4 one-story warehouses near pier (FIGURE VI - 37).
RR and roads:	RR spur 300′ to rear; road leads to ramp.
Remarks:	310′ quay to E of pier.

New Mole (Reference ⑧); details follow:

Location:	S of Wolmi-do causeway on W shore of inner harbor.
Construction:	2 ramp-piers, probably wood deck on pilings extending from newly reclaimed mole covering 90,000 sq. ft.
Length:	Both 130′ (15′ wide).
Depth alongside:	Owing to recent dredging heads of piers probably in shallow depths at low water.
Storage facilities:	On mole, 1 warehouse 85′ by 180′; to N of mole, 2 warehouses 45′ by 140′.
Cranage:	Small overhead conveyor (140′ long) N of mole, perpendicular with beach, for use by Japan Flour Co.
RR and roads:	Road exit; RR freight yard 300′ to rear.

SVO Pier (Reference ⑨); details follow:

Location:	NE shore of Wolmi-do.
Construction:	Probably wood deck on log piling.
Length:	95′ (15′ wide).
Depth alongside:	Dries at low water.
RR and roads:	Road exit only.
Remarks:	Projects from newly-reclaimed land covering approximately 300,000 sq. ft.; shore quayed for length of 560′ plus 800′; area formerly used by SVO for case oil.

Wolmi-do Oil Mole (Reference ⑩); details follow:

Location:	E end of Wolmi-do causeway.
Construction:	Sloping stone gravity wall.
	W side S side
Length:	224′ 320′
Depth alongside:	Dries at low water.
Storage:	1 known oil tank (15′ diameter) 3 storage buildings.
RR and roads:	Road exit; RR freight yard 800′ to rear.
Remarks:	Newly reclaimed area covering 72,000 sq. ft.

Open Storage Quay (Reference ⑪); details follow:

Location:	N of Wolmi-do causeway on W shore of Inch'on.
Construction:	Probably stone bulkhead.
Length:	NE side W side 685′ 1050′
Depth alongside:	Dries at low water.
RR and roads:	Road skirts quay; RR spur 200′ to rear.
Remarks:	Unidentified loose stores; possible case oil present (Jan. 1945 sortie); open storage area with average apron width of 280′.

Railroad Coaling Quay (Reference ⑬); details follow:

Location:	NW tip of city.
Type of construction:	Probably stone bulkhead.
	NW sides SW sides
Length:	900′ + 390′ 480′ + 480′
Depth alongside:	Dries at low water.
Storage:	Coal stores 200′ by 300′.
Cranage:	On northern SW side, one coal unloader and overhead conveyor.
RR and roads:	2 RR spurs to S of coal stores; 2 RR spurs E of coal stores; probable road exit.
Remarks:	Coal imported probably for railroad or industrial use.

Tōkyō Shibaura Quay (Reference ⑮); details follow:

Location:	N of city.
Operated by:	Probably Tōkyō Shibaura Electric Co.
Construction:	Probably stone bulkhead.
	NE side
Length:	2,560′.
Depth:	Dries at low water.
Storage:	4 probable warehouses and many other buildings between RR and Quay. Warehouse areas to E on newly reclaimed land.
RR and roads:	2 RR sidings behind buildings; probable road exit.
Remarks:	Extensive construction activities in this area. Much industrial expansion completed. Coal stores present.

(3) *Storage facilities.*

The increasing demands of the industrial Kyongsong area has led to the construction of many large modern warehouses, especially in the waterfront area. New warehouses have also been built to serve the industrial area on the north side of the city.

All foreigners were excluded from the vicinity of these warehouses in 1940; it is believed they are used for military supplies.

In the waterfront area are 73 known warehouses and godowns in Inch'on with a total ground area of 933,000 square feet. TABLE VI - 16 lists the known warehouses.

(4) *Capacity and clearance.*

(*a*) *Actual annual traffic.* In 1936 a total of 1,518 steamers with an aggregate tonnage of 1,525,040 tons entered port. In 1939 the tonnage reached 2,500,000 tons. Numerous steamship companies have small vessels calling here irregularly, but a regular schedule is maintained to Tsingtao, Dairen, and Chefoo.

(*b*) *Estimated unloading capacity.* The estimated unloading capacity for general cargo by ship's gear is 15,500 long tons per day, of which 3,000 long tons can be worked alongside the tidal basin wharves, and 12,500 long tons discharged from an estimated 25 Libertys anchored in the stream.

Lighters can reach the small craft landing facilities only at high tide.

The best months for working of cargo in the stream are May to July; and worst, October to February.

(*c*) *Facilities for clearing port.* Inch'on is connected with Kyongsong, the most important rail hub in Korea, by a standard-gauge railroad line. Trains run between Inch'on and Kyongsong every hour. A narrow-gauge railroad connects Inch'on with Suwon on the Kyongsong - Pusan line.

Spurs lead from the Inch'on Railroad Station to the wharves and storage installations at the harbor, and sidings have been laid to the newly reclaimed industrial area on the northeastern edge of the city.

Within the city the streets are narrow and poorly paved. A number of highways lead out of Inch'on, including a primary highway (reported to be about 60 feet wide) to Kyongsong, and a road to Suwon.

(5) *Supplies.*

(*a*) *Water.* Water is piped underground from the Han-gang (river) near Kyongsong to a reservoir located about 25 miles from Inch'on. The tidal basin and inner harbor are served by 11 water hydrants. There are ten 64 m/m hydrants at the tidal basin (Reference ④) with a total 10-hour capacity of 3,000 tons. Another hydrant is located at the Customs Ramp-pier No. 1 (Reference ⑦) with a 10-hour capacity of 300 tons. Two water-boats serve the harbor area, a 20-ton boat with a 10-hour capacity of 60 tons and a 30-ton boat with a 10-hour capacity of 80 tons. There are also two water tankers with a 10-hour capacity of 200 tons each.

(*b*) *Oil.* In addition to the Standard Vacuum Oil go-downs on Wolmi-do, numerous other Mitsubishi and Texaco case oil godowns are in the area behind the northeast side of the open Storage Quay (Reference ⑪), and south of the boatyard (Reference ⑫). An oil tank (diameter—15 feet) is on the Wolmi-do Oil Mole (Reference ⑩), south of the causeway to Wolmi-do. Two oil tanks with diameters of 40 feet and 28 feet respectively are to the east of the southern wharf in the tidal basin (Reference ④). Construction activity on probable oil tanks in Songhyon-ni, on the northeast side of Inch'on, is shown by aerial photographs.

The normal stocks of bunker fuel and diesel oil which can be supplied by floating pipe lines and lighters are about 21,000 barrels.

An unconfirmed report states that large underground tanks for oil storage were being constructed at Nanchai, south of Inch'on.

(*c*) *Coal.* Two thousand to 8,000 tons of Japanese bunker coal are usually kept in stock. Coal is supplied from the wharves in the tidal basin or from lighters in the roadstead.

A large well-equipped coaling station has been reported at Nanchai, south of Inch'on.

(*d*) *Electricity.* The Kyongsong - Inch'on region draws its electric power from the North Korean grid. A municipal power plant in Inch'on is in the northern section of the city.

(6) *Repair facilities.*

A new shipyard (Reference ⑭) is under construction on the northern edge of Inch'on; it consists of 3 covered ways and 2 drydocks. The apparently completed drydocks are 440 by 65 feet; and the covered ways are 140 by 42 feet. On the outer sides of the drydocks are rails for traveling cranes as yet uninstalled. The shipyard is located on the south side of a 750-foot-wide basin with a 1,250-foot breakwater opposite the yard. The whole area dries at low water.

A small boat yard (Reference ⑫), north of the Wolmi-do causeway, covers an area 220 by 1,000 feet. The largest craft on the slipways is 100 feet long. The longest way measures 125 feet.

J. Chinnamp'o.

(38°43'N, 125°25'E)

Chinnamp'o is in northwestern Korea on the Taedong-gang estuary about 30 miles from the sea (PLANS 31 and 44). About 16 miles farther up the Taedong-gang is the secondary port of Kyomip'o. Chinnamp'o is the principal port for the P'yongyang industrial and mining region, and it is the site of a naval coal depot. The coal depot has specialized coal-loading equipment and maintains a normal coal stock of 105,000 metric tons (Chapter XIII). Two nonferrous metals factories are at Chinnamp'o: the Chōsen Riken Metals Co. plant, which is estimated to have produced 5,000 tons of aluminum and 1,000 tons of magnesium in 1944, and the Japan Mining Co. plant, which produces lead, copper, and low grade zinc. Principal exports are rice, soy beans, iron, anthracite coal and paper; principal imports are iron, bituminous coal, hardware, fertilizers, oils, chemicals, and textiles.

Vessels of any draft can reach the harbor which provides about 40 first-class anchorage berths; the holding ground in some parts of the harbor is not good. Drift ice may block the entrance to the harbor for 3 weeks or more in the period from about the middle of January to the middle of February, and it may make anchoring difficult, if not impossible for a somewhat longer period.

Four 3,000-ton vessels drawing 20 feet can be berthed at the general cargo wharves in the harbor basin, and two 6,000-ton colliers can be berthed at the coal depot.

The estimated unloading capacity is 6,600 long tons of general cargo per day, of which 1,600 tons can be worked at the wharves in the harbor basin, and 5,000 tons worked at anchor into lighters.

(1) *Harbor.*

The harbor is a stretch of the Taedong-gang (river), which is about 1 mile wide and from 40 to 90 feet deep (FIGURE VI - 38). It is about 30 miles from the mouth, and is protected by mountains to the westward. However, in autumn and winter heavy swells may set in.

Narrow sand bars and mud flats off the banks on either side of the river dry at low water, but the 5-fathom contour lies close off the banks.

An artificial harbor basin (Reference ⑨)* has been constructed at Chinnamp'o, and since 1940 additional improvements have been undertaken which include extensive land reclamation for industrial use, the bulkheading of an increased length of the shore for lighters and small craft, and a new coal-conveyor installation.

(*a*) *Entrance channel.* The main channel of approach to Chinnamp'o is from the west through two large shoals Chung-ju (Chū-shū, Naku Su) and Ha-ju (Ka-shū, Shima Su). The width here is not less than a mile between the 5-fathom contours. From this point there is a passage either north or south of the central mud banks, but the shorter and deeper channel is on the southern side which passes just north of Chemae-do (Shimai-tō) and Sok-to (Seki-to). About 8 miles to the eastward, between Koisu-kaku and P'i-do (Hi-to, Pyo Somu), the navigable channel, called P'ido-sudo (Pyo Somu-sudo), is only 400 yards wide. Eastward of this point, the deep and winding channel through the tidal flats to Chinnamp'o is free from any dangers except for a few detached shoals. The average depth through the channel and the harbor is 10 fathoms.

There is also a southern approach to the Taedong-gang (river), entered between Changsan-got (Chōzan-kan, Chansan Kotsu) and the shoals lying south of Ch'o-do (Shiku-tō, Cho Tō) and then continuing northward through Ch'odo-sudo

* References are encircled numbers on FIGURE VI - 38.

(Choto Suidō); but the passage is complicated and there are strong tidal currents.

(*b*) *Anchorage.* Vessels of any draft can reach the extensive river roadstead within the harbor limits of Chinnamp'o. About 40 first-class anchorage berths are available in the harbor. The anchorage is well protected against heavy winds and swells by the surrounding hills, although in autumn and winter heavy swells may set in. Anchoring is difficult, if not impossible, during the period of drift-ice, which is at its worst from about the middle of January to the middle of February.

Large vessels anchor just off the entrance to the harbor basin (Reference ⑨) in depths of 7 to 15 fathoms. However, several precautions are necessary in this area. The holding ground is at best fair, with a thin layer of mud and sand over a rock bottom, and during west winds a vessel is liable to drag anchor.

Near Pibal-to lighthouse, the eastern entrance point of the harbor basin, anchorage is difficult due to the strong tidal currents and the countercurrent which sets towards the eastern wall of the harbor basin.

The best anchorage is found in mid-channel in depths of 10 fathoms and less, where the tidal streams are weaker and the holding ground is better.

Three mooring buoys, accommodating two 100-ton vessels and one 500-ton vessel, are reportedly in the harbor.

(*c*) *Significant hydrographic features.* At Chinnamp'o the mean high water interval is 8 hours 37 minutes. High water springs rise to 18 feet, neaps to 14 feet. The mean sea level is 10 feet.

At the mouth of the Taedong-gang (river), the ebb current attains a velocity of 4¾ knots. Around the projecting points and in the narrow channels, the flood current attains a rate of 3½ knots. In the center of the channel off Chinnamp'o the ebb current runs for 7½ to 8 hours, the turns occurring at high water stand and at 1½ to 2 hours after low water. Off both banks of the river the ebb current commences to run 1 to 2 hours earlier than in mid-channel.

Off the harbor basin, the main part of the flood (east-going) stream runs approximately up the middle of the river at a maximum rate of about 2½ knots; the main part of the ebb (west-going stream) runs well over towards the basin at a maximum rate of nearly 4 knots. Owing to the irregularity of the contour of the banks westward of the basin, the tidal streams near the basin are very complex.

Drift ice may cut off Chinnamp'o from the sea for 3 weeks or more during the winter. From about 22 January to 15 February, the drift ice forms a dense pack off Chemae-do (Shimai-tō), completely blocking the channel, although in recent years an increasing number of vessels have forced their way through. Drift ice appears at Chinnamp'o not more than 10 days after the upper reaches of the river and its tributaries are frozen over; water vapor rising from the whole surface of the river is an immediate warning of its approach.

Drift ice is worst in the channel mouth, between Chimae-do (Shimai-tō) and P'i-do (Pyo Somu), nearly 10 miles eastward, and conditions there determine whether entry into the river is possible; once past P'i-do (Pyo Somu) the greatest difficulties are past. Less drift ice may be anticipated during neap tides than during spring tides, as spring tides bring it off the banks.

During the seasons of the ice floes, navigation is difficult if not impossible; however, if a vessel is trapped by ice in mid-channel while riding the flood tide, the force of the current will carry her up the fairway. The optimum time for passage through P'ido-sudo (Pyo Somu-sudo) is one hour before high water. The color of the ice must be noted: green or white ice is easily broken and not dangerous; but brown or gray ice, having been formed on the banks which dry along the coast, is full of sand and mud, and is both dangerous and difficult to break.

(*d*) *Local weather.* Summers are warm to hot (70° to 80° F.), and winter temperatures range between 21° F. and 17.6° F., with 3 months from December to February below freezing. Snow may occur on 130 days; frost and ice on 190 days. A cold northwesterly wind prevails from December through May and northerly winds the remainder of the year; however, gales do not disturb the harbor. Heavy fog settles in the harbor from June to August. The rainy season usually starts around the early part of July and lasts through August.

(*2*) ***Landing facilities.***

The principal large vessel landing facilities at Chinnamp'o are in 2 groups: the general cargo group is in the harbor basin (Reference ⑨) west of Pibal-tō; the coal shipment group is at the coal plants (References ⑭ and ⑮) east of Kadok-to. Four 3,000-ton vessels can moor alongside the harbor basin wharves, and two 6,000-ton colliers can be loaded at the coal plants.

In 1937 the following harbor craft were available: 568 lighters with a total tonnage of 10,118 tons varying in size from 5-ton to 65-ton craft; one 26-ton tugboat; one 24-ton tugboat; one 12-ton motor launch; and numerous sampans.

Warehouses and transit sheds near the landing facilities are briefly treated in the tabular descriptions of the facilities. Details of these warehouses and of warehouses farther inland are listed in TABLE VI - 17.

(*a*) *Harbor basin* (Reference ⑨). The harbor basin has an entrance width of about 300 yards and covers an area of 273,570 square yards (FIGURE VI - 39). The greater part of the basin, including the area alongside the eastern and southwestern sides has been dredged to a depth of 20 feet. Although it is reported that the northern sides of the basin have been bulkheaded for use by lighters and small craft with a reported prevailing depth of 5 feet, air photographs show this section to be exposed at low tide. Owing to the rapid silting of the basin and entrance, constant dredging is necessary. Two dredges are at the port.

In the harbor basin during the ebb tide a strong eddy circles along the eastern wall of the basin. Vessels are liable to be swung around by it, and it is difficult to proceed alongside or leave this wall from one or two hours after high water until low water.

On the reclaimed area surrounding the basin are several warehouses and sheds. Railroad spurs connecting with the railroad station run parallel with each quay wall. The basin is served by traveling cranes and a small overhead conveyor for probable flour-loading.

Harbor basin (Reference ⑨); details follow:

Location:	W of Pibal-to.		
Purpose:	General cargo.		
Construction:	Concrete.		
	E side	SW side	N section
Length:	800′	850′	1,820′

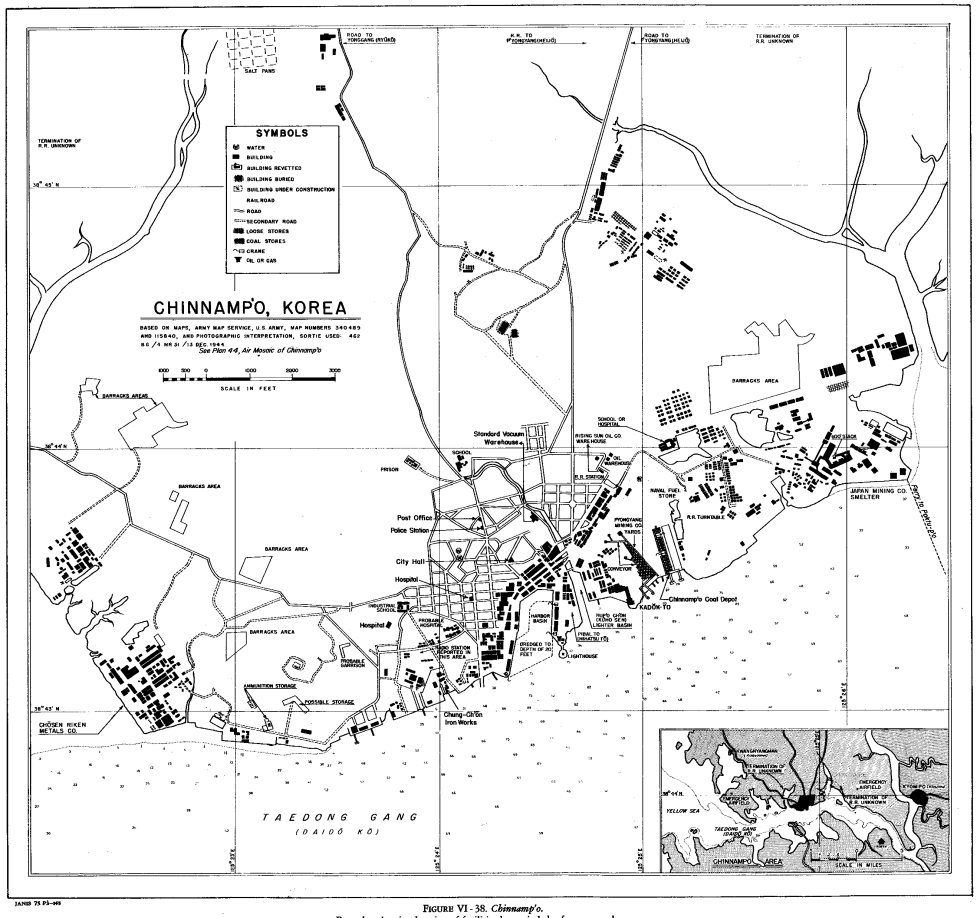

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FIGURE VI-38. *Chinnamp'o.*
Port plan showing location of facilities [name included] [reference numbers]

FIGURE VI - 39. *Chinnamp'o.*
Harbor basin (Reference ⑨), looking southward. Before 1930.

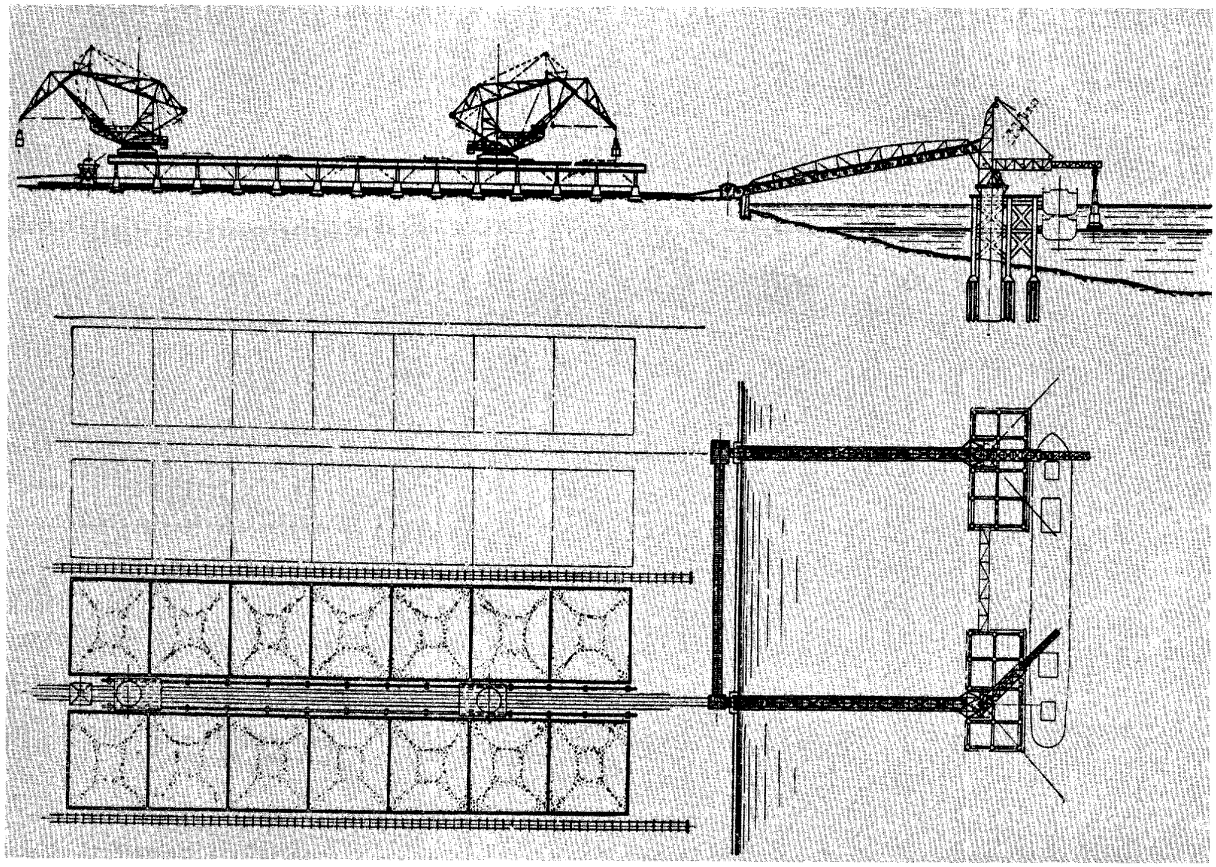

FIGURE VI - 40. *Chinnamp'o.*
Sketch of old coal conveyor plant (Reference ⑮), showing 2 Demag luffing cranes and 2 belt conveyor coal loaders with feeder system extending to storage area. 1933.

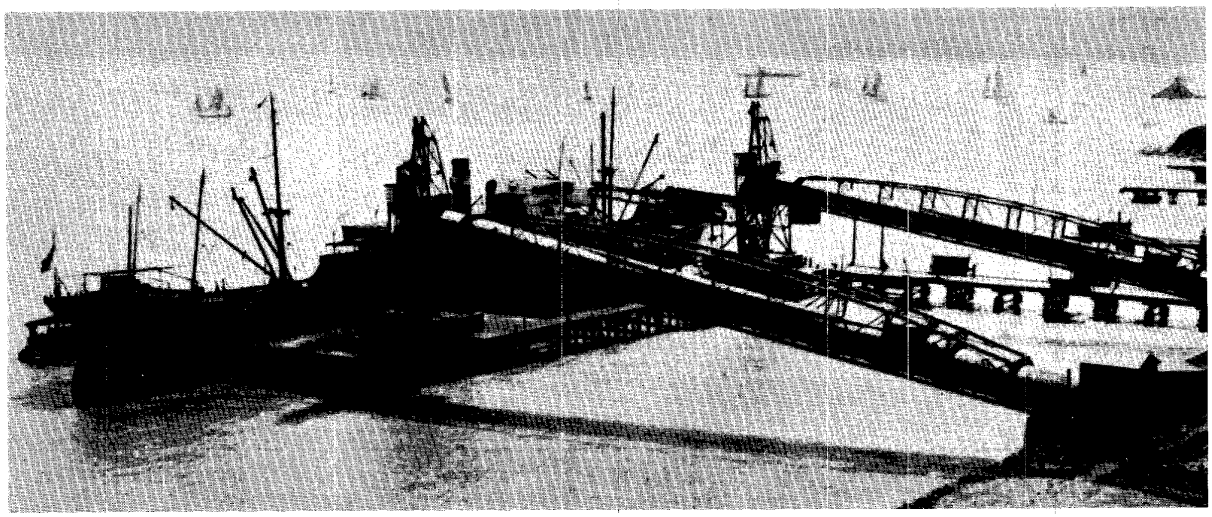

FIGURE VI - 41. *Chinnamp'o.*
Two conveyor loaders of old coal plant (Reference ⑮) with adjustable booms and telescopic chutes, looking southwestward.

Depth alongside:	20′	20′	Dries
Berthage:	Two 3,000-ton vessels drawing 20′.	Two 3,000-ton vessels drawing 20′.	Lighters
Storage:	Extensive warehouse area. Along SW wharf: 2 warehouses 120′ by 300′ by 15′. Along E wharf: 1 warehouse 65′ by 300′ by 12′; 1 warehouse 50′ by 180′.		
Cranage:	Two 1½-ton steam slewing traveling cranes. One 5-ton steam slewing traveling crane. One 5-ton stationary manual crane (probably located here, although air photographs showed only 3 cranes in the harbor basin: 1 crane on W side and 2 on E side). One overhead conveyor extending 140′ offshore for probable use in flour loading, W of basin entrance.		
RR and roads:	RR spurs and road connections serve both sides of basin and warehouse area; direct connection with Chinnamp'o RR station (Reference ⑱).		
Unloading capacity:	1,600 long tons per day.		
Remarks:	Deeper draft vessels may gain access due to soft mud bottoms; persistent reports claim basin dredged to accommodate 10,000-ton vessels; no verification. Largest vessel shown alongside by air photographs is 150′ coaster.		

(*b*) *Coal depot* (References ⑭ and ⑮). Chinnamp'o is the site of a naval fuel depot under the jurisdiction of the Chinkai Naval Station. Coal is shipped to the depot by rail from the extensive anthracite fields near P'yongyang. The coal exported from Chinnamp'o has been made into briquettes formerly used extensively by the Japanese Navy.

The coal facilities, east of Kadok-to, consist of 7 piers, 4 of which are equipped with conveyor loaders. Before the war the 2 easternmost conveyor loaders (FIGURES VI - 40 and VI - 41), operated by the government, were the only specialized coal handling equipment available. Two Demag luffing cranes worked the storage area to the rear from a trestle (FIGURE VI - 42). The other 5 piers, under the supervision of the P'yongyang Mining Company, were undeveloped except for tracks laid onto the piers for barge loading. Since the war, the government has assumed control of the entire depot. The 2 westernmost piers have been equipped with an independent conveyor-loader and feeder system. The water area alongside has been dredged to permit direct loading from shore to collier.

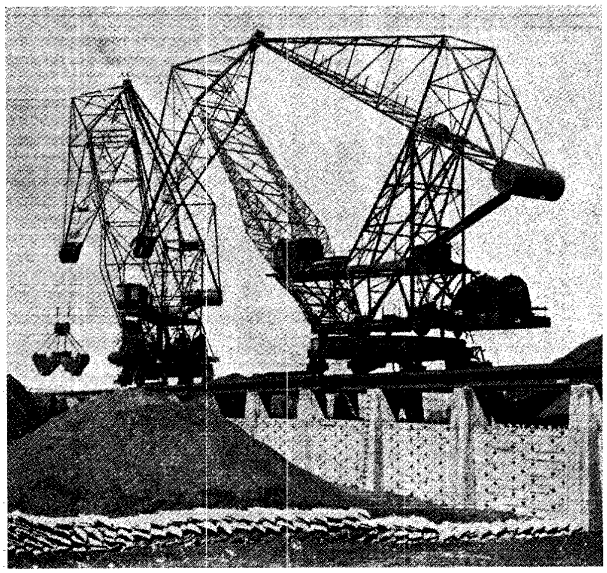

FIGURE VI - 42. *Chinnamp'o.*
Storage area of old coal conveyor plant (Reference ⑮) with 2 Demag luffing cranes. Feeder conveyor to offshore loaders probably underneath trestle. About 1936.

Old coal conveyor plant (Reference ⑮); details follow:

Location:	E of Kodok-to.
Operated by:	Government.
Purpose:	Anthracite coal loading.
Construction:	Wooden deck on log and concrete piling.
Dimensions:	2 support platforms (45′ by 80′) for conveyor-loaders, extending 210′ offshore, separated by 100′ of water.
Depth alongside:	28′ at face.
Berthage:	One 6,000-ton collier working 2 holds simultaneously.
Storage:	Open coal storage area: 180′ by 900′; 70,000 metric tons of coal reported stored.
Cranage:	2 conveyor coal loaders with adjustable booms; 10-hour capacity of 3,000 tons each. 2 Demag luffing and slewing locomotive cranes (maximum radius, 88′ 6″; minimum radius, 36′) serve storage area.

RR:	1 RR trestle (gauge unknown) in center of storage area for Demag cranes (FIGURE VI - 42). 2 RR spurs on each side of storage area. RR turntable to NE of storage area.
Remarks:	This plant independent of the New Coal Conveyor Plant (Reference ⑭). Coal brought in by rail, dumped in storage area; Demag cranes reclaim coal and drop it directly on feeder-conveyor probably located underneath trestle.

New coal conveyor plant (Reference ⑭); details follow:

Location:	E of Kadok-to.
Operated by:	Government.
Purpose:	Anthacite coal loading.
Construction:	Probably wooden deck on log and concrete piling.
Dimensions:	2 support platforms (25′ by 40′) for conveyor loaders, extending 250′ offshore, separated by 130′ of water.
Depth alongside:	27′ at face.
Berthage:	One 6,000-ton collier working 2 holds simultaneously.
Storage:	Open coal storage area triangular shaped: 450′ by 650′; 35,000 metric tons of coal reported stored.
Cranage:	2 new conveyor coal loaders with extensive network of connected feeder-conveyors from storage area; may be similar to conveyors of Old Coal Plant (Reference ⑯).
RR:	2 RR spurs to E of storage. 3 RR spurs to W of storage. Gondolas dump coal into storage area.
Remarks:	To E of conveyor platforms are 3 piers (wooden decks on log pilings). 2 easternmost piers: length, 100′; width, 10′. Westernmost pier (probably connected with conveyor system): length, 130′; width, 15′. Piers used for barge coal loading. One mooring buoy off Kadok-to.

(*c*) *Miscellaneous facilities.* The total length of quays and bulkheads for small craft and lighters is approximately 8,000 feet. In air photographs all the small craft in the harbor were moored at right angles to these quays; and all the quays, but not the projecting piers, were exposed at low tide.

Hup'o Ch'on Lighter Basin (Reference ⑪); details follow:

Location:	E of Pibal-to.
Purpose:	Lighters and small craft.
Construction:	Sloping, masonry bulkhead. Total length of bulkheaded bank—2,740′.
Length:	E side 140′ + 750′; W side 1,000′; E of Basin Entrance 500′ + 350′
Depth:	Reported prevailing depth of 4′. (Air photographs showed basin exposed at low water.)
Storage:	Serves extensive warehouse area E of Hup'o-ch'on.
Cranage:	None.
RR:	RR spur parallel to E quay.
Remarks:	Area of basin is approx. 26,640 sq. yds. Entrance width, 190′. Landing stage for small craft 90 yds. E of basin entrance, length, 200′; width, 15′; depth alongside, 6′. Unloading done primarily along E side of basin; craft moor at right angles.

Case Oil Piers (Reference ④); details follow:

Purpose:	Unloading of lighters.			
Construction:	Wooden deck on log piling.			
		Face	E side	W side
Length:	Support pier	10′	145′	145′
	for Conveyor Other Pier	15′	170′	170′
Depth alongside:	Both piers 12′ at face and sides; possibly less near shore.			
Storage:	1 warehouse 80′ by 80′; 2 warehouses 40′ by 200′.			
Cranage:	Conveyor on E pier.			
Roads:	Road connections only.			
Remarks:	All oil products are lightered from vessels in roadstead.			

Korea Commerce and Industry Co. Pier (Reference ⑤); details follow:

Operated by:	Probably Korea Commerce and Industry Co.		
Purpose:	Small craft.		
Construction:	Wooden deck on log piling.		
	Face	E side	W side
Length:	15′	130′	130′
Depth alongside:	12′ at face and sides; possibly less near shore.		
Roads:	Road connections only.		
Remarks:	Adjoining quays total 845′.		

Ferry Ramp (Reference ⑦); details follow:

Location:	W of Harbor Basin.		
Purpose:	Possible ferry landing.		
Construction:	Sloping concrete ramp.		
	Face	E side	W side
Length:	50′	200′	200′
Depth alongside:	Dries alongside.		
Roads:	Road connections only.		
Remarks:	Ferries shuttle between Chinnamp'o and road towns on south bank of Taedong-gang (river). Adjoining quays in this area total 1,000′.		

(3) *Storage facilities.*

Extensive storage facilities for general cargo, rice, coal and other industrial products are available at the Chinnamp'o waterfront. The city is considered to be the largest rice storage depot in Korea and vast quantities of rice are stored in large sheds just westward of the harbor basin.

Air photographs show an estimated 92 warehouses with an approximate total ground space of 734,800 square feet in the vicinity of the waterfront. Roads and railroad spurs serve the more important installations. The harbor basin area has 13 road exits.

TABLE VI - 17 summarizes the known warehouses in Chinnamp'o with estimated dimensions and ground space. Estimated usable capacity is computed on the basis of two-thirds of the total cubic capacity when height of warehouse is known.

Considerable open coal storage is behind the coal depot piers (References ⑭⑮). Several small open areas are near the landing facilities.

(4) *Capacity and clearance.*

(*a*) *Actual annual traffic.* In 1937 a total of 905 steamers with an aggregate tonnage of 1,063,108 tons entered port.

Coastal mail steamer service is maintained between Chinnamp'o and North China, Japan, Taiwan (Formosa) and western Korean ports. Motor launches ply the Taedong-gang (river) several times daily to furnish connections with the various river ports. Ferry service links Chinnamp'o with several road junctions on the south bank of the Taedong-gang (river), including Che-do (Cho-tō), site of an improved road, and Mangdalli-gi, site of an unimproved road.

Ships drawing not more than 30 feet can reach Kyomip'o, a secondary port 16 miles upstream. P'yongyang, a large town about 25 miles farther upstream, can be reached only by small launches and barges.

TABLE VI - 17
WAREHOUSES AT CHINNAMP'O

REFERENCE AND LOCATION	NO.	WIDTH (FT.)	LENGTH (FT.)	TOTAL GROUND AREA (SQ. FT.)	REMARKS
② NW of small boat yard	1	80	250	20,000	Reported SVO godown. Accessible by road.
② N of SVO godown	29	20	25	14,500	Possible warehouses.
④ E of small boat yard	1	80	80	6,400	Packaged oil warehouses.
	2	40	200	16,000	
⑧ Along W quay of basin	2	120	300	72,000	Height 15 feet; estimated usable capacity each 360,000 cu. ft. Construction reported wood and corrugated iron. Used for general cargo and rice; accessible by RR and road.
⑧ Behind W quay of basin	15	50	180	135,000	
⑧ NW and W side of basin	7	80	150	84,000	Dimensions of largest.
⑧ Inland from basin	12	40	400	192,000	
⑩ Along E quay of basin	1	65	300	19,500	Height 12 feet; estimated usable capacity 156,000 cu. ft. Reported wood and corrugated iron construction. Used for general cargo and rice; accessible by RR and road. road.
	1	50	180	9,000	
⑩ On W side of Hup'o-ch'on lighter basin	14	50	170	119,000	Dimensions of largest building.
⑫ E side of Hup'o-ch'on lighter basin	6	45	145	39,150	Average size. Inland are additional storage buildings and reported light industries, 1 of which is flour mill. Area accessible by RR.
⑬ SW of Chinnamp'o RR station	1	30	275	8,250	Largest warehouse SW of Chinnamp'o RR station in light industry and warehouse area; accessible by RR and road.
	92			734,800	Total

(*b*) *Estimated unloading capacity.* The estimated port capacity for working general cargo alongside and in the stream by ship's gear totals 6,600 long tons per day, of which 1,600 long tons can be worked alongside the wharves in the harbor basin (Reference ⑨), and 5,000 long tons discharged from an estimated 10 Libertys riding at anchor. In offshore unloading, seasonal and tidal difficulties are encountered. Owing to the excessive tidal range and drying out at low tide of the shore area used by small craft, lighters can gain access to shore facilities only at high tide. During the ebb flow in autumn and winter, heavy swells may set in, and working cargo by lighter is difficult. In the rainy season in July and August, cargo cannot be worked at maximum speed. During the period of drift ice (middle of January to middle of February, approximately), cargo is discharged entirely at the wharves, with cargo being worked in the stream only in unusual instances.

(*c*) *Facilities for clearing port.* Chinnamp'o is connected with P'yongyang Junction with the north - south main lines, by a standard-gauge, single-track railroad operated by the Korean P'yongan Railway Company. Another railroad reportedly runs from Chinnamp'o to Yonggang.

Railroad spurs serve the landing facilities in the harbor basin (Reference ⑨), the lighter basin (Reference ⑪), and at the coal depot (References ⑭⑮). A 7-track marshalling yard is near the railroad station.

P'yongyang and Chinnamp'o are joined by a primary highway. An improved coastal road (over 12 feet wide) trends northwestward from Chinnamp'o to K'wangnyangman and Hamjong-ni (Kanju-ri). An improved road (less than 12 feet wide), trends northward to Yonggang and Kangso. A network of improved and unimproved roads runs laterally, connecting the three above roads north of Chinnamp'o.

(5) ***Supplies.***

(*a*) *Water.* The quality of the water is excellent. At the harbor basin wharves are two 21-inch hydrants with a maximum capacity of 200 tons for 10 hours. There is also one hydrant with a 10-hour capacity of 300 tons at the coaling plants. One source reports a total of 6 ship-service hydrants. A water-boat with a 10-hour capacity of 120 tons serves the harbor area.

(*b*) *Oil.* Four fuel tanks on Pibal-to (Reference ⑩) with a total capacity of 7,400 barrels; 3 of these tanks are 20 feet in diameter and 30 feet high with a volume of 1,600 barrels each, and 1 tank is 25 feet in diameter and 30 feet high with a volume of 2,600 barrels.

Oil godowns and warehouses are listed in TABLE VI - 17.

(*c*) *Coal.* Stocks of about 105,000 metric tons of coal are usually awaiting shipment at the coal depot. The Korea Commerce and Industry Company is reported to maintain stocks of approximately 5,000 metric tons.

(*d*) *Electricity.* The city has a small electric light plant. Most of the power feeding this industrial area comes from the Sup'ung-dong hydroelectric plant on the Yalu River, via the North Korean grid.

(6) ***Repair facilities.***

The Korea Commerce and Industry Company shipyard (Reference ⑥) builds small vessels and is reported to have a maximum construction capacity of 300-ton steel vessels and 500-ton wooden ships. It is also reported to do light repair work on engines and hulls. Air photographs show a small graving-dock 40 by 140 feet under construction, 5 craft 60 feet long, and 330 feet of small slipways. There are 10 shop buildings of which the largest is 40 by 185 feet.

Another small boat yard (Reference ③), with 400 feet of beach and 160 feet of slipways, is west of the Korea Commerce and Industry Company, and it may be used for the repair and construction of oil barges. Air photographs show about 25 boats of 50-foot length at the yard. The adjoining 1,000 feet of reclaimed beach (Reference ①) is possibly being used for small boat repair.

62. *Secondary Ports*

A. Sosura (Seisuira).
(42°16′N, 130°36′E)

Sosura is on the northern part of Korea's east coast, about 4 miles from the Tuman-gang and the Russian border (PLAN 4). It is in the southeast corner of Sosura-hang (Seisuira-kō), the easternmost bight in Chosan-man (Zōzan-wan), a large and much indented bay. Sosura is a small fishing village with facilities for landing and repairing small craft. Larger vessels may find anchorage outside breakwaters in Sosura-hang which provides about 4 first-, 3 second-, and 4 third-class anchorage berths. The bay is protected from winds between north and southeast, but is exposed to the south and southwest winds of summer. Drift ice is common from late December until late March, and shore-fast ice frequently extends 400 to 600 yards offshore during this period. The ice doesn't prevent ocean-going vessels from using the bay, but does interfere with lightering operations.

(1) Harbor.

Sosura-hang (Seisuira-kō, Poyan Anchorage) is an open bay lying between Hwangdan-tan (Ko Tan) on the north and P'ansok-tan (Hanseki Tan), 1¾ miles to the south; at its widest point, the bay indents the coastline a little less than a mile (FIGURE VI-43). It is well protected from winds between north and southeast, but it is very much exposed to the south and southwest winds of summer, when Unggi-hang and Ch'angjin-man afford better protection. Depths on a line between the entrance points range from 16 fathoms in the

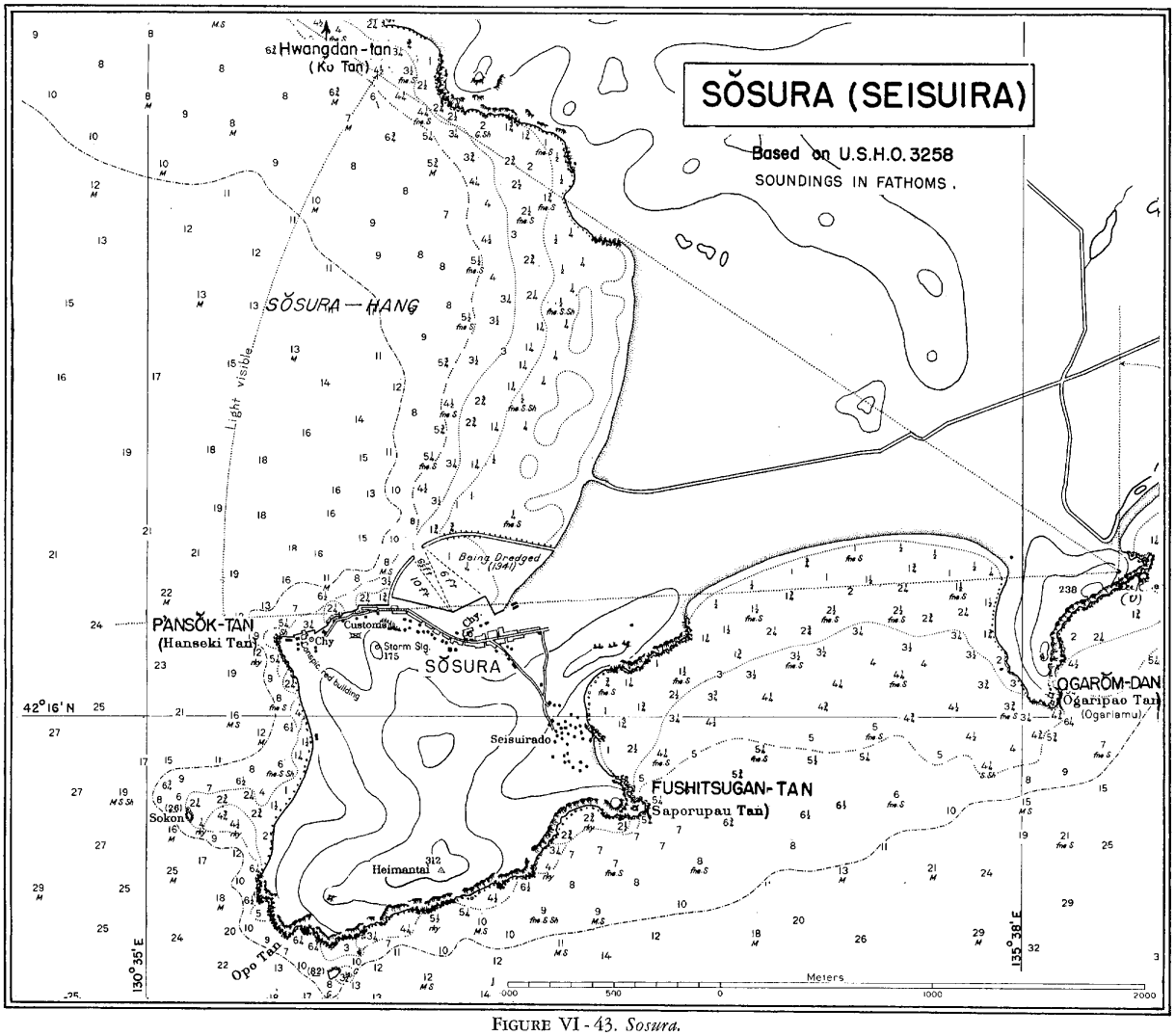

FIGURE VI-43. *Sosura.*
Map of harbor.

southern part to about 7 fathoms in the north, and shoal gradually to 3 fathoms at the seaward extremity of a sandy shoal bank which extends some 700 yards outward from the head of the bay. Aside from the shoal bank there are no dangers in the bay, and vessels may anchor anywhere according to their draft.

Just southeast of Sosura-hang, across a narrow neck of land, is a shallow bay. Lying between Fushitsugan-tan (Saporupan Tan) on the west and Ogarom-dan (Ogaripao Tan), a little over a mile to the east, it indents the coast about ½ mile. Although completely exposed to the south, it is better protected from the north than Sosura-hang, and is frequently used as an alternative anchorage. Depths range from 5 fathoms at its outer limit to 3 fathoms at the seaward extreme of the coastal reef, which extends about ¼ mile offshore.

The port is situated in the southeastern corner of Sosura-hang, and consists of a 1,550-foot quay protected by a breakwater and a groyne, and a 400-foot quay just westward of the protected area. The breakwater, about 600 yards eastward of Pansok-tan (Hanseki Tan), extends 650 feet north-northeastward, and the groyne, about 1,500 yards east-northeast of Pansok-tan (Hanseki Tan), curves westward 2,000 feet. The entrance between the two is about 100 yards wide. The small area within has been dredged to depths of from 6 to 9½ feet, except in the eastern portion, which is dominated by a sandbar.

(*a*) *Anchorage.* Outside the breakwaters in Sosura-hang there are 4 first-, 3 second-, and 4 third-class anchorage berths. The bay to the southeast affords 4 second- and 2 third-class anchorage berths.

(*b*) *Hydrography and weather.* Tides, currents, and weather are much the same as those for Chosan-man (Zōzan-wan) as a whole. (Topic 61, A, (1)). As in all of Chosan-man (Zōzan-wan), drift ice is common from late December until late March, and shore-fast ice frequently extends 400 to 600 yards offshore during this period. Although there is no instance of the ice being thick enough to prevent ocean-going vessels from entering or leaving the harbor, it does interfere with the operation of lighters. Strong northwest winds frequently make loading and unloading impossible in winter, and force ships to seek shelter in the bay to the southeast, where there are no terminal facilities.

(*2*) ***Landing and storage facilities.***

Fronting the town, in the western portion of the enclosed area, is a 1,550-foot quay, construction unknown, with depths alongside of about 6 feet. Just westward of the breakwater, outside the protected portion of the harbor, is the customs quay, about 400 feet long, construction unknown, with depths alongside of 10 to 14 feet. A customs shed, approximately 200 feet long, is on the customs quay, but there are no buildings on the inner quay. There appears to be open storage space behind both inner and outer quays.

Harbor improvement plans call for breakwaters and wharves to be constructed in the bay to the southeast, and for a canal across the low neck of the peninsula connecting the 2 harbors; however, there is no indication that these plans have been carried out. Harbor craft are limited to three 40-ton lighters.

(*3*) ***Capacity and clearance.***

(*a*) *Actual annual traffic.* In 1936, four steamers with a total tonnage of 3,459 tons, and 1,596 sailing vessels with a total tonnage of 21,656 tons entered the port.

(*b*) *Facilities for clearing port.* Directly inland of the quays and parallel to them is a third-class road and a special railroad, both leading northeastward. The railroad terminates after 4 miles at Doriton, on the Tuman-gang, and the road continues to Kyonghung, a more important town farther up the river. The 2 harbors are connected by road, and there is a third-class road which follows the shores of Chosan-man (Zōzan-wan) northwest to Unggi.

(*4*) ***Supplies.***

Supplies are extremely limited. Water is obtained from wells, but there are no water-boats to transfer it to vessels in the harbor. There are no facilities for supplying coal, although the hinterland is rich in coal deposits.

(*5*) ***Repair facilities.***

Three small shipyards with repair facilities for fishing craft are reported, but their exact location is unknown.

B. Odaejin-hang.
(41°23′N, 129°47′E)

Odaejin-hang (Gyotaishin-kō) is a small bay on the east coast of Korea, about 25 miles south of Chongjin (PLAN 5). It is a fishing base. About 8 third-class anchorage berths are available, but none of the landing facilities are in greater depths than 6 feet.

(*1*) ***Harbor.***

The port is on an open, northward-facing bight at the southern end of Kyongsong-man (FIGURE VI - 44). An area of about 350 acres in the inner and eastern portion of the bight has some protection and forms the outer harbor. It affords good anchorage except when strong winds are blowing from between north and east and it provides about 8 third-class anchorage berths. Depths inside the outer harbor are from 38 to 66 feet, shoaling rather rapidly to 18 feet at 1,200 to 1,400 feet from shore, and to 6 feet at 330 to 840 feet from shore.

An inner harbor is formed by 2 breakwaters in the southeastern part of the bay, at the village of Odaejin. The inner harbor has an area of about 26 acres, and depths range from 17 feet at the entrance to 3 feet inshore. Depths alongside the quays which face the reclaimed land along the village waterfront are 6 feet or less. Sea-going vessels anchor in the outer harbor.

No specific information concerning tides and currents in Odaejin-hang is available. At nearby coastal points, however, the mean high water interval is generally about 2 hours, 50 minutes; spring tides generally rise 1 foot and neap tides 8 inches to 1 foot. Tidal streams are negligible along the whole coast, and currents are generally weak and irregular.

(*2*) ***Landing facilities.***

The quayed frontage on the reclaimed land within the inner harbor consists of 3 sections (660 feet, 750 feet, and 360 feet in length), with a depth alongside of 3 to 6 feet.

Outside the inner harbor and west of the Tongnyonho-ch'on (Tōrenko-sen) (river), which flows into the bay near the base

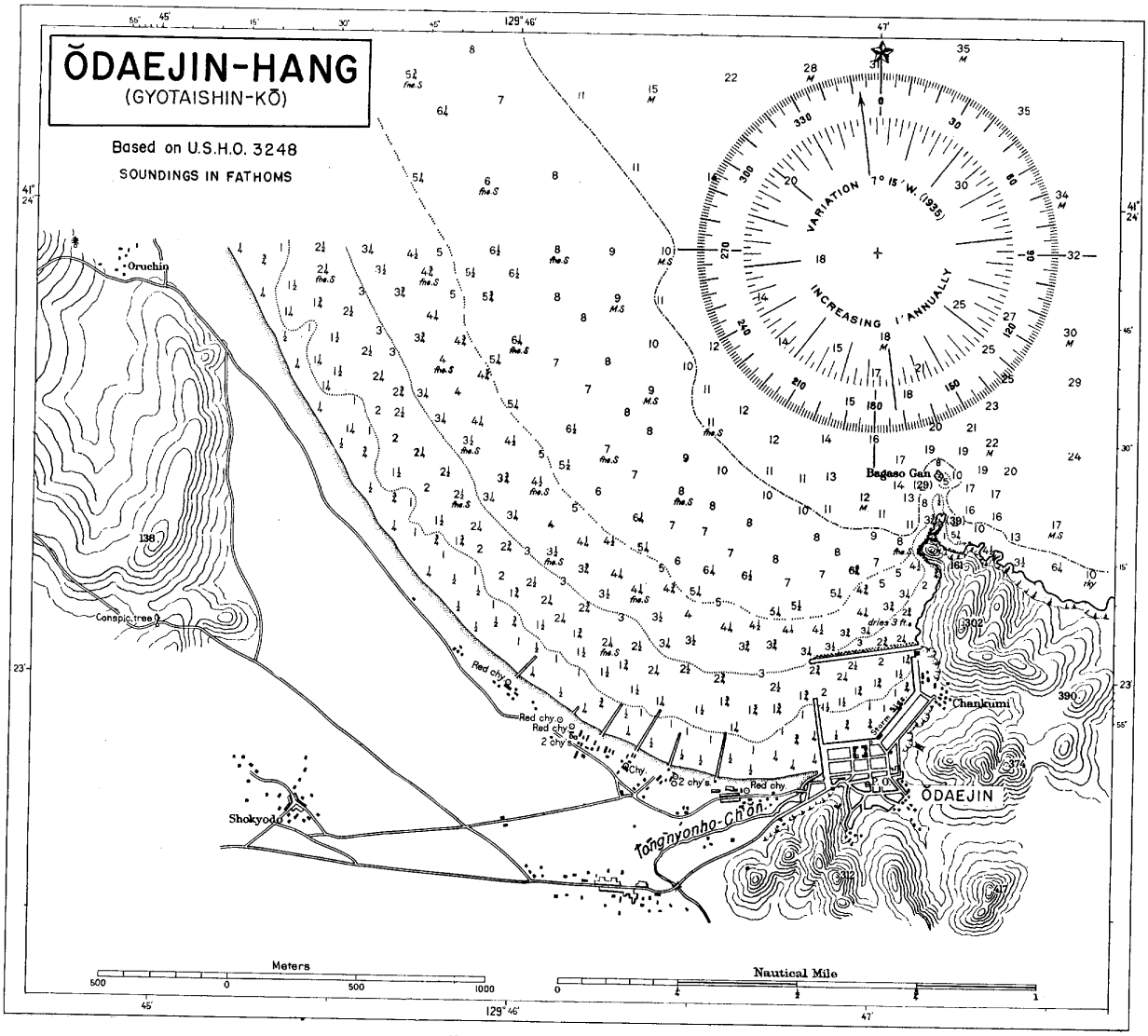

FIGURE VI - 44. *Odaejin-hang.*
Map of harbor.

of the west breakwater, are 6 privately owned piers; no information is available as to their construction or use. Dimensions of these piers are as follows:

NUMBER OF PIERS	LENGTH (FT.)	DEPTH ALONGSIDE FACE (FT.)
2	600	6 to 7
2	450	6 and 3
1	360	3
1	120	1.5
Total 6		

(3) *Capacity and clearance.*

In 1936, 136 steamships, totaling 118,750 tons, and 381 sailing vessels, totaling 2,359 tons, entered the harbor.

There is regular steamer communication with other ports in Korea and with Ōsaka and Tsuruga in Japan, and occasional steamer communication with Vladivostok.

An improved road connects Odaejin with the primary east coast highway at Yongch'on-dong, about 8 miles southwestward, and with the east coast railroad both at Yongch'on-dong and at Yongp'yong-dong, about 3½ miles west-northwestward.

(4) *Supplies.*

Within the village of Odaejin there are 7 wells, 2 of which supply good drinking water. Water for general use is also available from the Tongnyonho-ch'on (Tōrenko-sen). There is, however, no equipment for supplying ships with water.

No fuel supply is reported, although limited quantities of petroleum products are probably available for the fishing fleet.

C. Yongom-ni (Yonam-ni).

(40°23'N, 128°55'E)

Yongom-ni (Ryūgan-ri) is on the east coast of Korea about 18 miles northeast of Ch'aho and about 2½ miles south of the inland town of Tanch'on (PLAN 7). It has an artificial harbor,

part of which is in operation and part still under construction. The port is probably intended to be used in connection with an unidentified industry about ¾ mile inland. Information on the port is based entirely on aerial photographs; no information is available in charts and pilots. No depths or details on landing facilities (if any) are available, but apparently the port's facilities are to be in 2 basins, only one of which is completed. There is no protected anchorage outside the relatively small water areas within breakwaters.

(1) Harbor.

The harbor consists of 2 artificial basins, protected by breakwaters (FIGURE VI - 45).

The South Basin, which is complete enough to be used by small coastal steamers, is protected by a breakwater extending eastward for 1,671 feet at the south side of the entrance and by another extending southeastward for 598 feet from the shore north of the entrance to the basin. The basin has an area of about 29 acres, the main portion consisting of a rectangle 2,668 feet long and 402 feet wide, running northeast and southwest parallel to the shore line. At the north corner a canal 46 feet wide is being constructed north-northwestward.

Northwest of about the middle of the basin there are 3 completed one-story buildings, one of which measures 92 feet by 23 feet, the others 63 feet by 35 feet each. Around the southwestern end of the basin there are several sheds: one, at the south corner, is 75 feet by 22 feet; one at the end of the basin has a completed section 195 feet by 23 feet; one north of this end of the basin is irregular in shape, being 198 feet long and 46 to 69 feet wide. Northeast of this are 6 smaller sheds, each 69 feet by 23 feet. East of the 3 finished buildings at the middle of the basin are 2 sheds each 126 feet by 23 feet. The foundations for a number of more permanent buildings, probably warehouses, are visible northwest of the sheds around the south end of the basin.

The North Basin is still under construction, and its final size and shape cannot be determined. The northern arm, which is most nearly finished, is 310 feet wide and has a completed length of 575 feet. The basin is protected by a breakwater extending south-southeastward for 1,587 feet, from northeast side, and by a short jetty at the southeast side of the entrance.

(2) Capacity and clearance.

The South Basin has 4,990 feet of bulkhead shoreline at which vessels apparently can moor. At the time observed, there were 9 small coasters, all approximately 110 feet by 25 feet, alongside the storage area at the southwestern end of the basin. There were also 8 lighters varying in size from 46 feet by 16 feet to 23 feet by 12 feet.

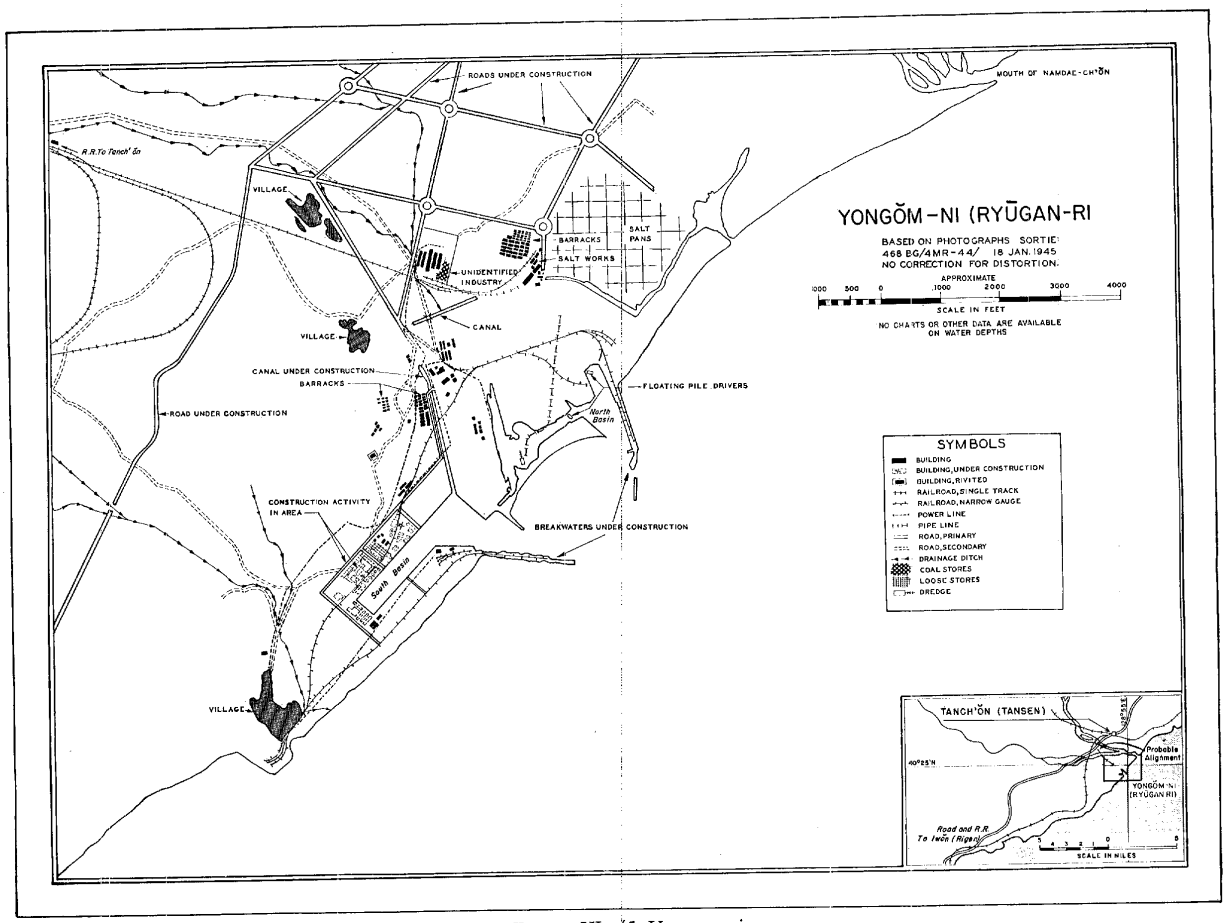

FIGURE VI - 45. *Yongom-ni.*
Sketch of harbor.

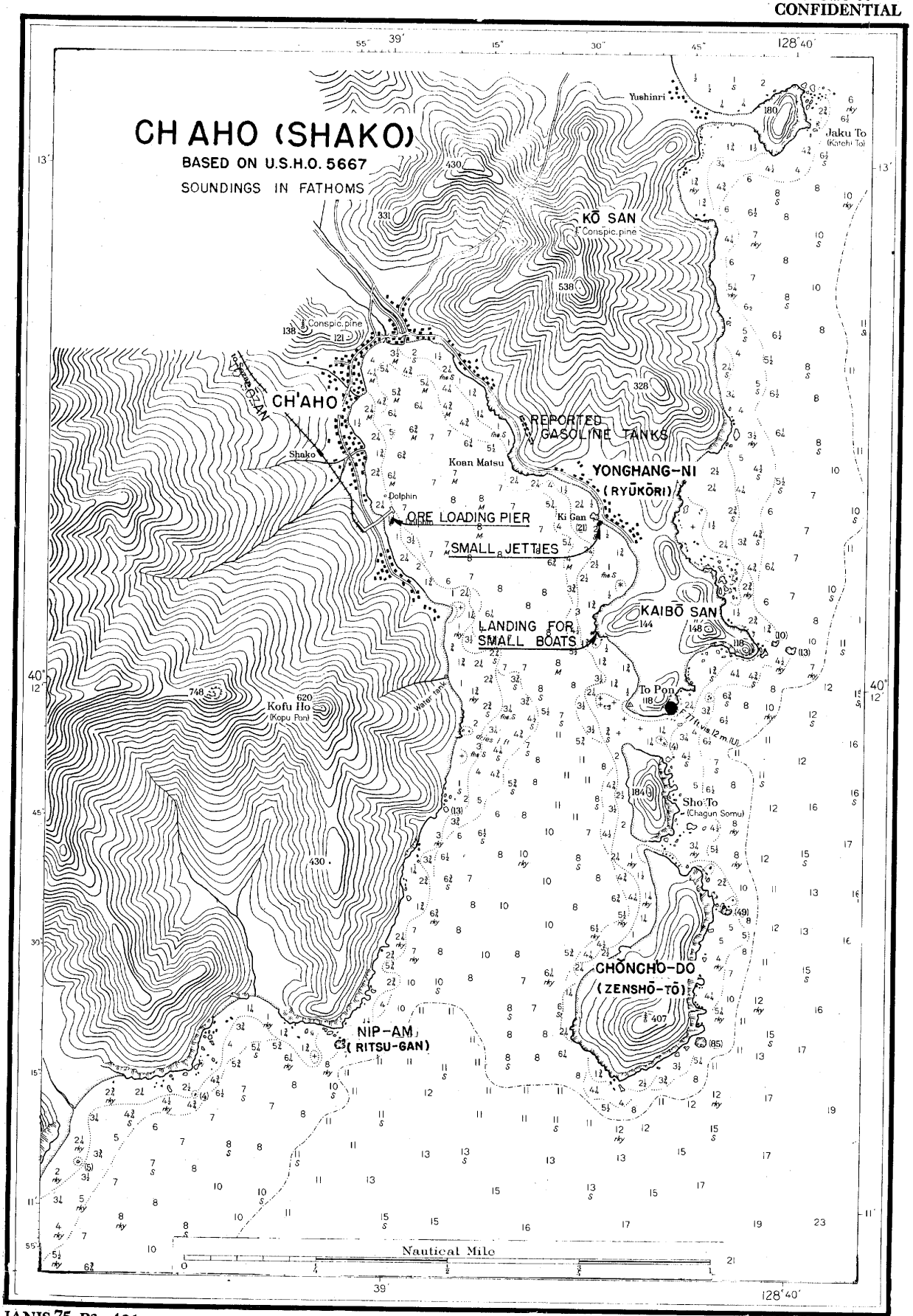

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FIGURE VI-46. *Ch'aho,* Map of Harbor.

A number of roads are under construction. One apparently runs northward along the coast. Three others, which apparently converge not far off the area of photo coverage, lead in the general direction of Tanch'on, the nearest sizable town.

A spur from the railroad has been built to Yongom-ni, running down to an area north of the North Basin, where there is a rail-car loading machine. About 1¾ miles northwest of the South Basin there is a loading platform beside the tracks.

(3) Supplies.

Considerable supplies of coal, brought in by rail, are maintained at the unidentified industry. As yet, however, there seem to be no means of getting the coal to the boat basins.

D. Ch'aho (Shako).

(40°12'N, 128°38'E)

Ch'aho (Shako), an iron ore loading point, is on the northeast coast of Korea, about 164 miles north of Wonsan and 166 miles south of Ch'ongjin by rail (PLAN 7). It is approximately 400 miles from Yawata, Japan, the terminal point for Ch'aho iron ore. The mines, about 7 miles inland, are connected by rail directly to the modern ore loading system on the port's only significant pier. The deep harbor, protected from all but southerly winds, can provide about 1 first-, 1 second-, and 3 third-class anchorage berths. Depth alongside the face of the ore pier is 27 feet, but construction of the pier does not permit unloading. It is estimated that the pier can load about 225 tons of ore per hour with a force of 12 laborers loading ore-buckets from a storage bin.

(1) Harbor.

The harbor is well protected by surrounding mountains from all but southerly winds (FIGURE VI - 46). The water area measures approximately 1½ miles long and from 500 to 800 yards wide.

Ships enter going north between Chonch'o-do (Zenshō-tō), an island forming part of the eastern shore of the bay, and Nip-am (Ritsu-gan), a small island off the western shore. General chart depths within the bay are from 66 feet at the entrance to 42 feet at the head. The channel, generally wide and deep, becomes shallower (33 to 42 feet) and narrower (150 yards) about half-way up.

There are 3 third-class anchorage berths at the head of the bay, and 1 first- and 1 second-class anchorage berths in the southern half of the bay. The mud bottom of the bay affords good holding ground.

The harbor rarely has either high winds or waves. The mean high water interval is 2 hours and 48 minutes. Springs and neaps both rise approximately one foot.

Ch'aho has summer temperatures of about 89° F.; snow begins to fall in November, but does not exceed 1 foot. The rainy season extends throughout June, July and August. Dense fog occurs on an average of 9 days per year from March through August, and ice is known to form in the harbor in the months of freezing temperatures. However, neither are believed to interfere with shipping.

Before the installatiton of the ore conveyor at Ch'aho, loading operations could only be carried on in calm weather, as ore was at that time loaded into barges by manual labor. Now, however, it is reported that a ship carrying 3,500 to 5,000 tons of ore is loaded in 2 days, regardless of weather conditions.

(2) Landing facilities.

The only important facility at Ch'aho is the ore-loading pier (FIGURES VI - 47, VI - 48, VI - 49).

The ore loader, constructed in Germany,* consists of a storage bin of 5,000-ton capacity, situated on the railway from which it is filled by bottom-discharging cars. Motive power is provided by a 10-horsepower heavy-oil engine.

The pier is an open-work steel structure supported on piles with a monolith concrete capping. Water depth at the face is 27 feet, and vessels alongside are moored to 2 dolphins. The construction of the pier does not permit unloading.

Ore buckets, each of 1⅛-tons capacity, are loaded from the bin through chutes with hand-controlled doors. From 180 to 200 ore buckets per hour are loaded by a force of 12 laborers. Ore buckets run at intervals of 20 seconds at a speed of 4.1 feet per second. At the pier end of the conveyor, ore buckets are automatically discharged and feed a telescope chute leading to the ship's hold. At present, only one hold at a time is known to be loaded; however, an extension of the pier, allowing 2 holds to be loaded simultaneously, has been proposed.

Miscellaneous landing facilities, all minor and locations unknown, are reported by a Japanese source as follows:

Small wooden jetty: length, 32 feet; width, 8 feet; water depth, 19 feet; suitable for small craft.
Wharf: Length, 36 feet; width, 29 feet.
Wharf: Length, 42 feet.
Village of Yonghong-ni (Ryūkō-ri): Jetties for small boats.

(3) Capacity and clearance.

(a) Loading capacity. The loading capacity of the ore-loading pier is estimated to be about 225 tons per hour (maximum) with a force of 12 laborers loading ore buckets from the storage bin.

(b) Facilities for clearing port. Before the installation of the ore conveyor at Ch'aho, ore was brought from the mines by a narrow-gauge railway and discharged on the shore for barge-loading. However, sometime before 1934 connections between the mines and the port were improved by the laying of a 7-mile branch extension of the Government Railways. In addition to this line, via Ch'anghung-ni, Ch'aho may be connected with the east coast railroad by means of a single-tracked, standard-

* Bleichert-Transportanlagen G.m.b.H., Leipzig.

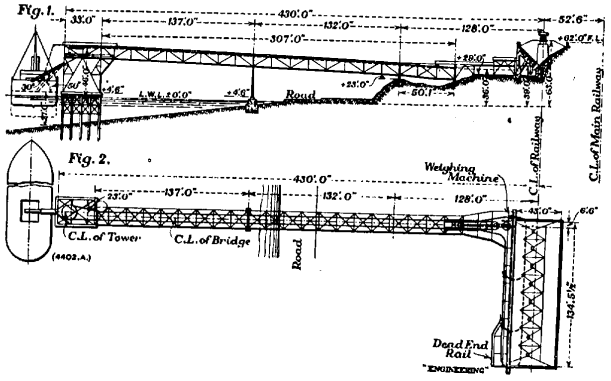

FIGURE VI - 47. *Ch'aho.*
Sketch showing details of ore-conveyor.

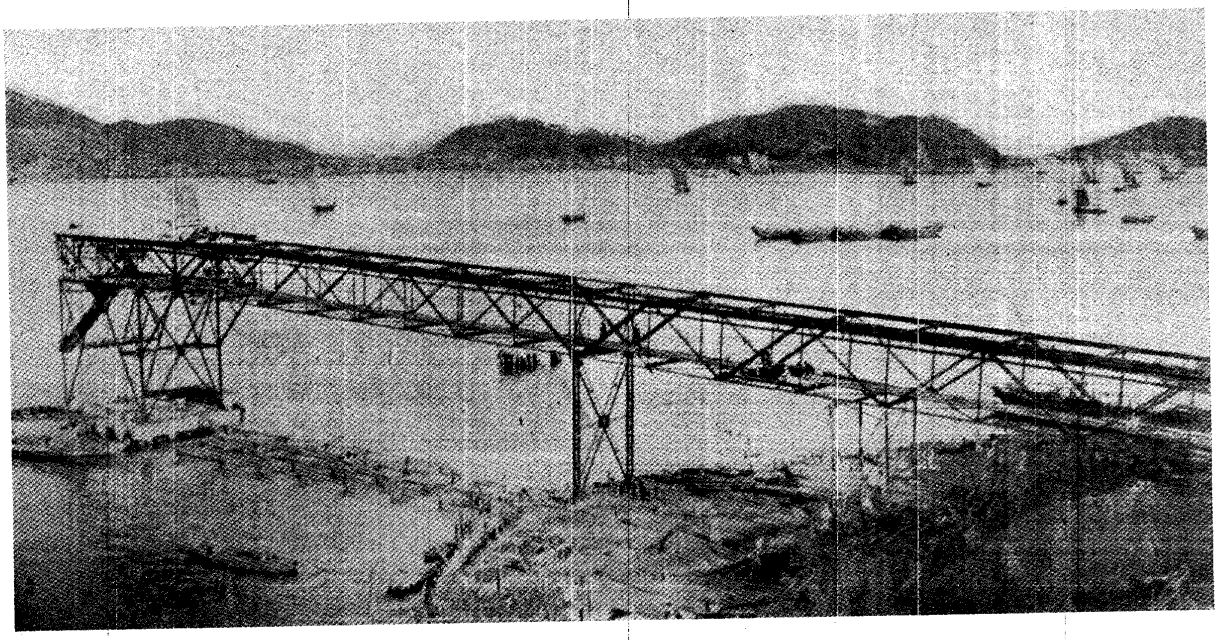

FIGURE VI - 48. *Ch'ahо.*
Ore-loading pier, looking southeastward. 1930.

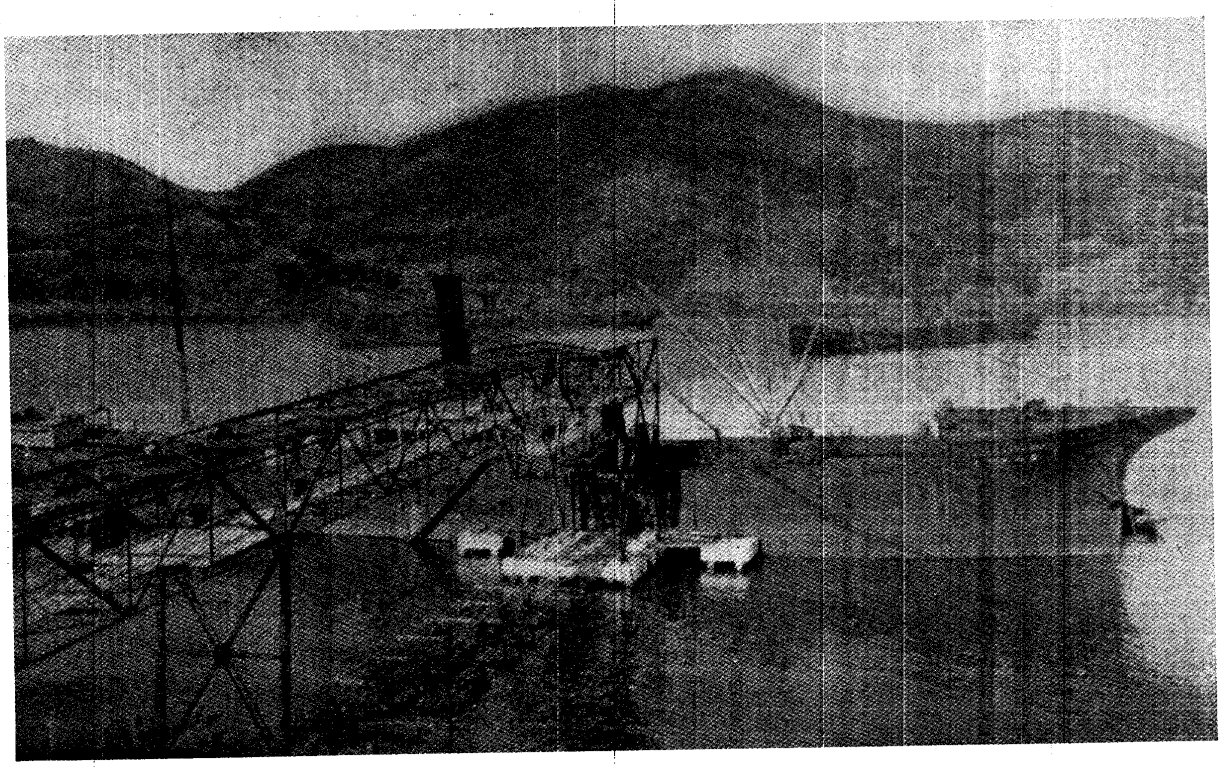

FIGURE VI - 49. *Ch'ahо.*
Ore-loading pier, looking northward. 1930.

gauge line which runs near Chungsan-ni about 3 miles northwest. There the highway from Ch'aho also connects with the east coast highway.

(*4*) *Supplies.*

(*a*) *Water.* There are good wells at Ch'aho. About a third of the distance up the west shore of the bay there is a water storage tank with a capacity of 1 ton. However, the water is not potable.

(*b*) *Oil.* Reported gasoline tanks directly across the bay from the ore conveyor have not been verified.

E. Sinch'ang.
(40°08'N, 128°28'E)

Sinch'ang (Shinshō) is a small fishing port on the east coast of Korea at the mouth of a river called the Namdae-ch'on (PLAN 7). It is about 11 miles southwest of Ch'aho. Harbor works are in process, including reclamation and enlargement of the port area. About 8 third-class anchorage berths, tenable probably only in northerly winds, are available. Some of the shoreline in a probably completed boat basin may be quayed; there is also a small pier in 6 feet of water.

(*1*) *Harbor.*

The harbor is open to the southeastward, and, since a heavy swell sets in with northerly winds, it is not a good anchorage

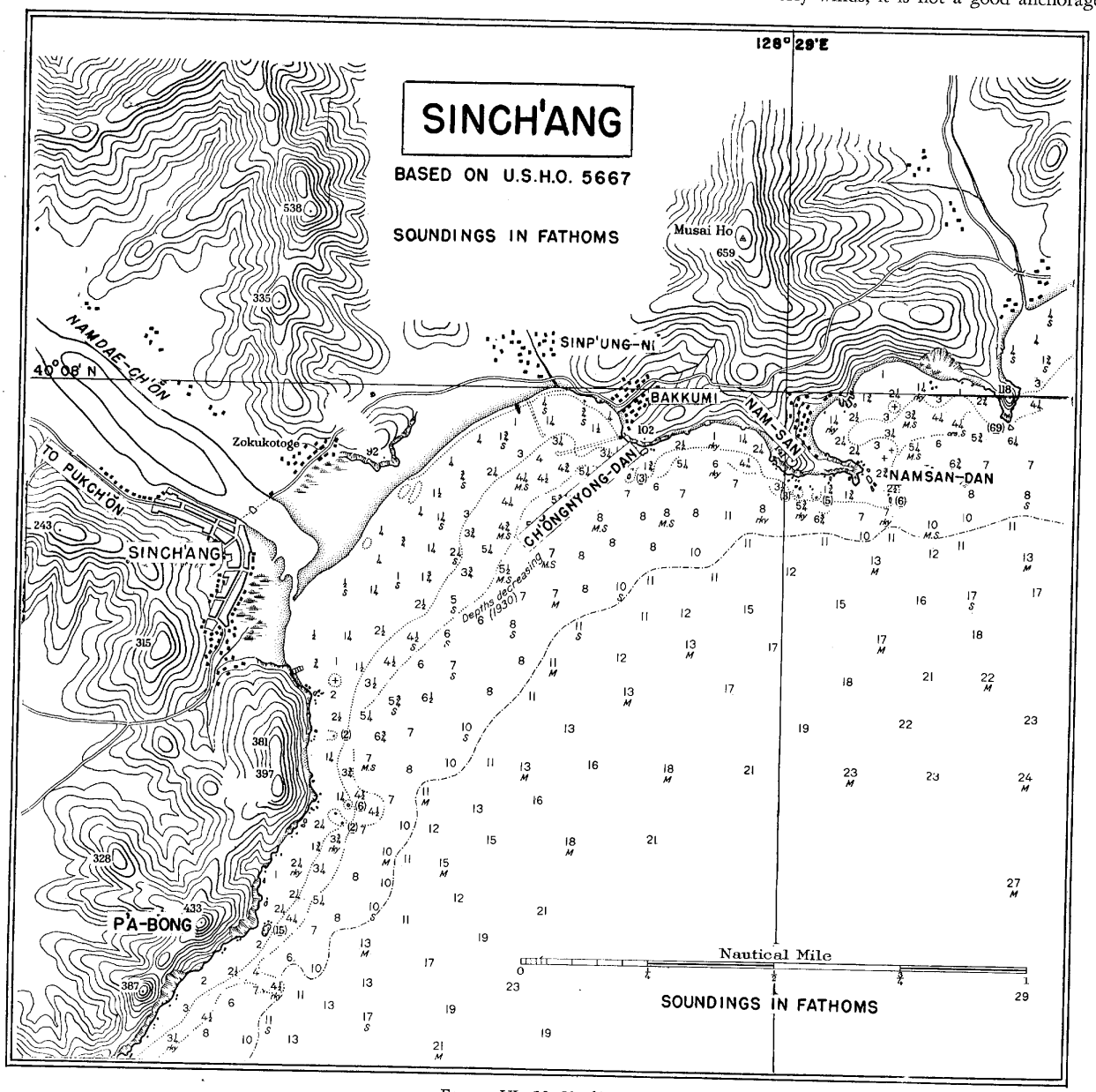

FIGURE VI - 50. *Sinch'ang.*
Map of harbor.

(FIGURE VI - 50). The best position is within a line drawn from a point near P'a-bong (Paa-pon) to Namsan-dan where there is a water area of about 325 acres with room for about 9 third-class anchorage berths.

At the northeastern end of the bay a boat basin with a water area of about 12½ acres was reported under construction in 1932, and is now probably completed.

Depths are about 60 feet at the entrance to the harbor, decreasing to 18 feet at from 600 feet to 1,150 feet from shore, the bottom being somewhat steeper-to at the northeastern than at the southwestern end of the bay. It was reported in 1930 that depths less than those charted were found in the southwestern end, off the mouth of the Namdae-ch'on.

The mean high water interval is 2 hours, 48 minutes. The average rise of tides (both spring and neap) is 1 foot.

The currents off this part of the coast are weak and variable. The tidal streams are negligible.

(2) Landing facilities.

A boat basin of about 12½ acres at the northeastern end of the harbor, reported under construction in 1932, has probably been completed. It lies along the frontages of the villages of Sinp'ung-ni and Oegumi (Gaikōmi, Bakkumi). Nothing is known of landing facilities in this basin, but probably at least part of the shoreline is quayed.

A short distance southwest of the boat basin is a small pier, about 100 feet long, with 6 feet of water alongside at its head.

(3) Capacity and clearance.

Seven steamships, totaling 5,203 tons, and 601 sailing vessels, totaling 4,860 tons, entered the harbor in 1936.

The village of Sinch'ang is on an improved road under 12 feet wide which connects it with stations on the east coast railway and with other towns on the east coast of Korea. The nearest railway stations are Soho-ri (Seiko-ri), about 4 miles westward, and Taedong, about 3 miles to the north. At Taedong the road joins the primary east coast highway leading to the main ports of the east coast and connecting with highways to the west coast of Korea.

A ferry across the Namdae-ch'on connects Sinch'ang with the villages of Sokkoch'i (Zokkoji, Zokukotoge), Sinp'ung-ni, and Oegumi (Gaikōmi, Bakkumi) (site of new boat basin) by means of an unimproved road, which continues northeastward up the coast.

(4) Supplies.

There are several wells, and one of them within the city limits supplies good drinking water. No information concerning facilities for supplying ships with water is available.

F. Sinp'o.
(40°01'N, 128°12'E)

Sinp'o (Shinho) is a small port on the east coast of Korea about 25 miles southwest of Ch'aho (PLAN 7). It is protected by the island of Mayang-do, about a mile southward, and the area between Mayang-do and the mainland forms the harbor of Sinp'o.

Sinp'o is a fishing port and is also used as a harbor of refuge. The fishing villages of Yukt'aedong-ni and Nonamtsun-ji, close westward, are nearly continuous with Sinp'o and are treated with it as 1 port. Four bays on the west and north sides of Mayang-do contain several smaller fishing villages. The fishing villages on Mayang-do probably provide only for local consumption; but all along the waterfronts of the villages on the mainland are small plants for the mild curing of fish, together with drying sheds and racks.

About 38 first-, 22 second-, and 23 third-class anchorage berths are available; most of the first-class berths are exposed eastward. The principal landing facilities are in the bay of Sinp'o proper; a pier at the fish meal plant can accommodate small coastal steamers; a pier on the eastern side of the bay has a head 20 feet wide in 12 feet of water. Sixty-one other piers on the mainland and 24 on Mayang-do are used by fishing craft and sampans.

(1) Harbor.

The total harbor area, eastward of a line drawn from the southwestern tip of Pongsu-pando to Taegu-dan (Daikyu-tan) on Mayang-do, and westward of a line drawn from Saekchak-tan (Shokusaku-tan) at the northeastern entrance point of the harbor to the tip of Pogulgumi-dan (Hotorukumi-tan), on Mayang-do, is about 4,260 acres (FIGURE VI - 51). It has room for about 38 first-, 22 second-, and 23 third-class anchorages. Most of the first-class anchorages are exposed eastward but have good shelter against winds from north and south and some shelter from westerly winds. The second- and third-class anchorages are for the most part better protected, being chiefly within the various bays on the south side of the mainland and the north and west sides of Mayang-do.

The mean high water interval is 2 hours, 52 minutes. Spring tides rise 1 foot, neap tides 8 inches. Tidal streams in the harbor are weak and irregular.

The climate of Sinp'o is more temperate than that of Wonsan, and strong winds are rare. The prevailing winds in early summer are from between east and southeast, and in late summer and early autumn from the south and southwest.

In winter, winds from between west and northwest prevail, but easterly winds occur at times. During the winter it begins to blow every day with moderate force at the beginning of the afternoon and seldom moderates before nightfall.

The rainy season occurs during July and August, when southeasterly winds usually bring rain.

Snow occurs from November to February.

Fogs are prevalent in April, May and June, usually during easterly winds.

(2) Landing facilities.

The principal landing facilities are in 2 main areas—both along the frontage of the village of Sinp'o. At the southwestern side of the bay of Sinp'o proper, just north of Saam-dan (Shigan-tan), there is a fish-meal plant of the Japan Food Industrial Co., which has 4 piers, the largest about 184 feet long and 35 feet wide. The charted depth at the head of this pier is only about 6 feet, but it seems to have been dredged somewhat deeper and can accommodate small coastal steamers (FIGURE VI - 52).

The other area of principal facilities is at the northeastern side of the bay of Sinp'o proper, where an area about 288 feet long and 104 feet wide has been reclaimed. At the west side of this reclaimed land a pier extends 241 feet from the shoreline and its head is 20 feet wide in a depth of 12 feet. This appears to be the main facility for handling general shipping.

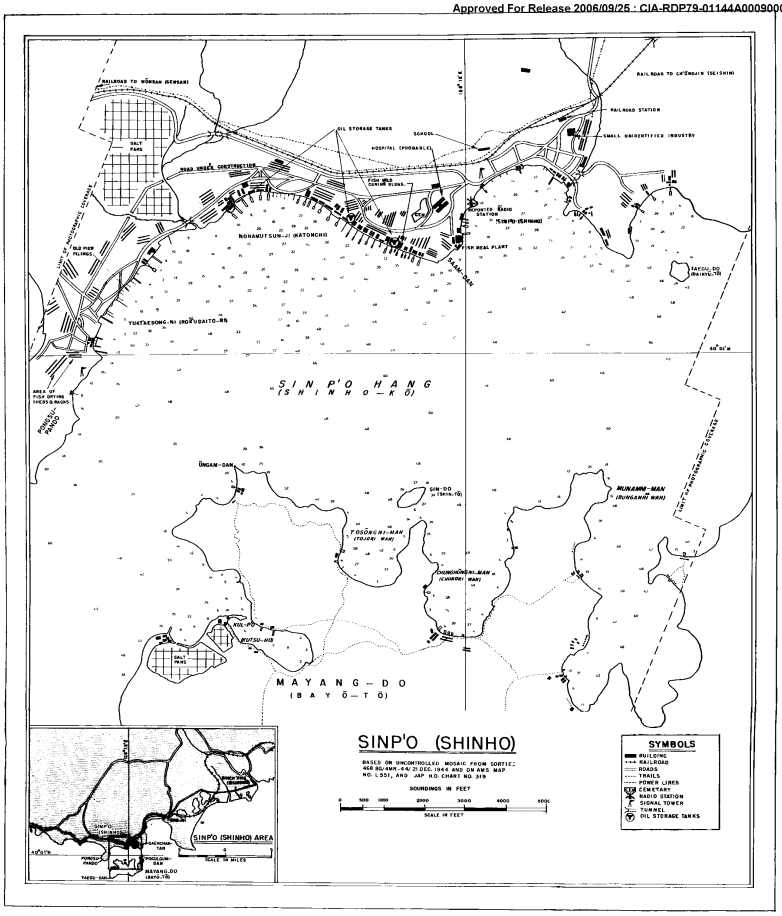

FIGURE VI-51. *Sinp'o.*
Port plan showing location of facilities.

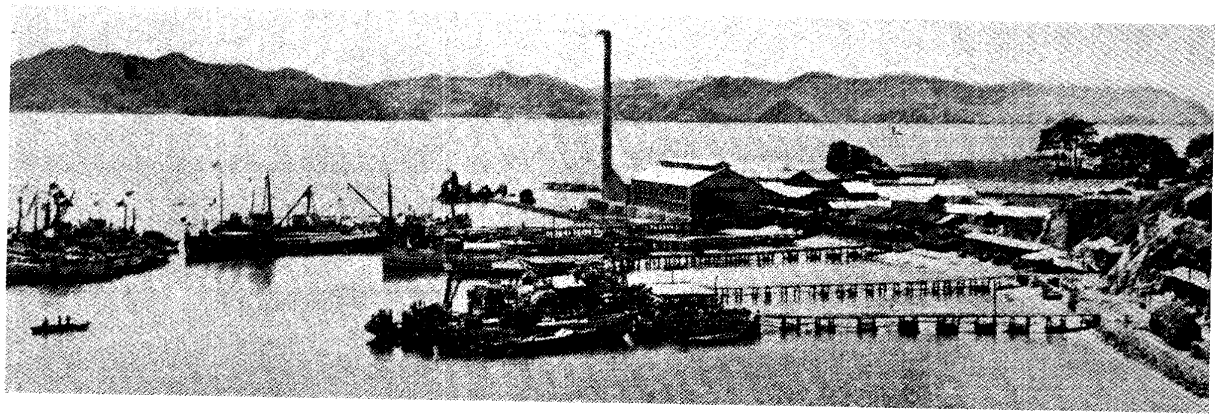

FIGURE VI - 52. *Sinp'o.*
Piers at fish meal plant, looking southward, showing small coastal vessel at farthest pier. Before 1937.

FIGURE VI - 53. *Sinp'o.*
Small fishing piers, believed to be looking eastward, before 1930.

At Sinp'o, besides these principal piers, there are 21 other piers ranging downward to 60 feet long and 12 feet wide, which are used by fishing craft (FIGURE VI - 53).

At Yukt'aedong-ni, in the western part of the harbor, there are 10 usable piers ranging in size from 250 feet by 23 feet to 150 feet by 12 feet and used by fishing craft and sampans. There are also the remains of 9 old piers, of which only the pilings remain.

At Nonamtsun-ji, farther eastward, there are 30 piers ranging from 370 feet by 35 feet to 160 feet by 12 feet, also used by fishing craft and sampans. The pilings of 5 old piers remain.

Kul-p'o (Kutsu-ho) is a boat harbor on the western side of Mayang-do. It is shallow and its mouth is nearly closed by a low sand spit. Outside the sand spit there are 2 small piers, and there are 2 more inside the spit.

On Ungam-dan (Yōgan-tan), a headland on the northwestern side of the island, there is a small fishing village with 1 pier.

In T'osongni-man there is a fishing village with 2 small piers.

There is a fishing village with 8 small piers in Chunghungni-man.

In Munamni-man there are 2 villages and 7 small piers.

(3) Capacity and clearance.

In 1936, 205 steamers, totaling 203,916 tons, and 1,896 sailing vessels, totaling 64,651 tons, entered the port.

There is a regular steamer communication with other ports in Korea and with Ōsaka in Japan, and there is occasional steamer communication with the Japanese port of Tsuruga.

Sinp'o is on the east coast railway between Wonsan and Ch'ongjin and on the east coast highway connecting the port with other towns on the east coast of Korea and connecting with highways to the west coast.

(4) Supplies.

There are 3 isolated oil storage tanks at Nonamtsun-ji. They are, in order of size: 35 feet in diameter, by about 30 feet high; 35 feet in diameter by about 20 feet high; and 20 feet in diameter by about 20 feet high.

Fresh water is of poor quality. No information concerning facilities for supplying it to vessels is available.

G. Kojo-p'o.

(38°58′N, 127°53′E)

Kojo-p'o (Kotei-ho) is a small fishing port and refuge harbor on the east coast of Korea about 43 miles by rail south of Wonsan (PLAN 10). The harbor can provide about 16 third-class anchorage berths but depths near the entrance are sufficient to permit four of these near the entrance to be combined into 2 first-class anchorage berths. The only landing facilities are 3 small piers with 6 feet of water at their heads.

(1) Harbor.

The natural bay harbor has a water area of about 512 acres, open northeastward. The village of Kojo is at the southeastern end of the bay, flanked by heights to the north, on the eastern side of the bay, and west, on the southern shore of the bay. (FIGURE VI - 54). This part of the bay has natural shelter from easterly winds, provided by the high eastern shore of the bay; protection against northerly winds and swells has been provided by the construction of a breakwater extending westward from the eastern shore of the bay about 1,530 feet north of the village. West of the village a short groin projects northward from the southern shore of the bay. The harbor has room for 16 third-class anchorages, but depths are sufficient to permit four of these near the entrance to be combined into 2 first-class anchorages.

Depths in the entrance are from 42 to 35 feet, decreasing gradually to 18 feet at about 250 yards from shore and to 6 feet at about 50 to 100 yards from shore.

The mean high water interval is 2 hours, 45 minutes. Mean spring rise is 1 foot, neap rise 8 inches.

(2) Landing facilities.

The only landing facilities at Kojo-p'o are 3 small piers along the waterfront of Kojo, about 175 feet, 65 feet, and 30 feet long, respectively. All have about 6 feet of water at their heads.

(3) Capacity and clearance.

In 1936, 14 steamships, aggregating 11,273 tons, and 1,071 sailing vessels, aggregating 7,973 tons, entered the harbor.

Kojo is on the east coast railway between Pusan and Wonsan and on an improved road connecting with the east coast highway.

(4) Supplies.

There are considerable deposits of coal in the vicinity, and formerly about 8,500 tons a year were mined. It is believed that the yield was greatly increased after the opening of the east coast railway. Nothing is known of storage or bunkering facilities.

H. Changjon-hang.

(38°44′N, 128°12′E)

Changjon-hang (Chōsen-ko) is a small harbor on the east coast of Korea about 68 miles by rail south of Wonsan (PLAN 11). The natural harbor is used as a base for fishing and whaling vessels and is being developed as a general harbor and a harbor of refuge. The harbor, which is protected from all winds except those from the northeast, can provide about 39 third-class anchorage berths. Of the many piers in the harbor, the Transport Pier, which has a 60-foot face in 10½ feet of water, is the only one which can berth anything larger than a fishing boat.

(1) Harbor.

The depth in the entrance of the harbor is 42 feet, decreasing gradually to 18 feet at about 225 to 300 yards from shore. The water area of the harbor is about 1,100 acres. (FIGURE VI - 55).

The harbor is protected against all winds except those from the northeast, which cause a swell to set in; however, part of the harbor along the front of the village of Changjon is also protected from this direction. The protected area is being expanded by a breakwater under construction southeastward from Ch'ongnyong-dan, on the northern shore of the bay.

Small vessels with local knowledge can obtain good anchorage, with shelter from all winds, about 400 yards west of the southern extreme of Ch'ongnyong-dan in a depth of 21 feet,

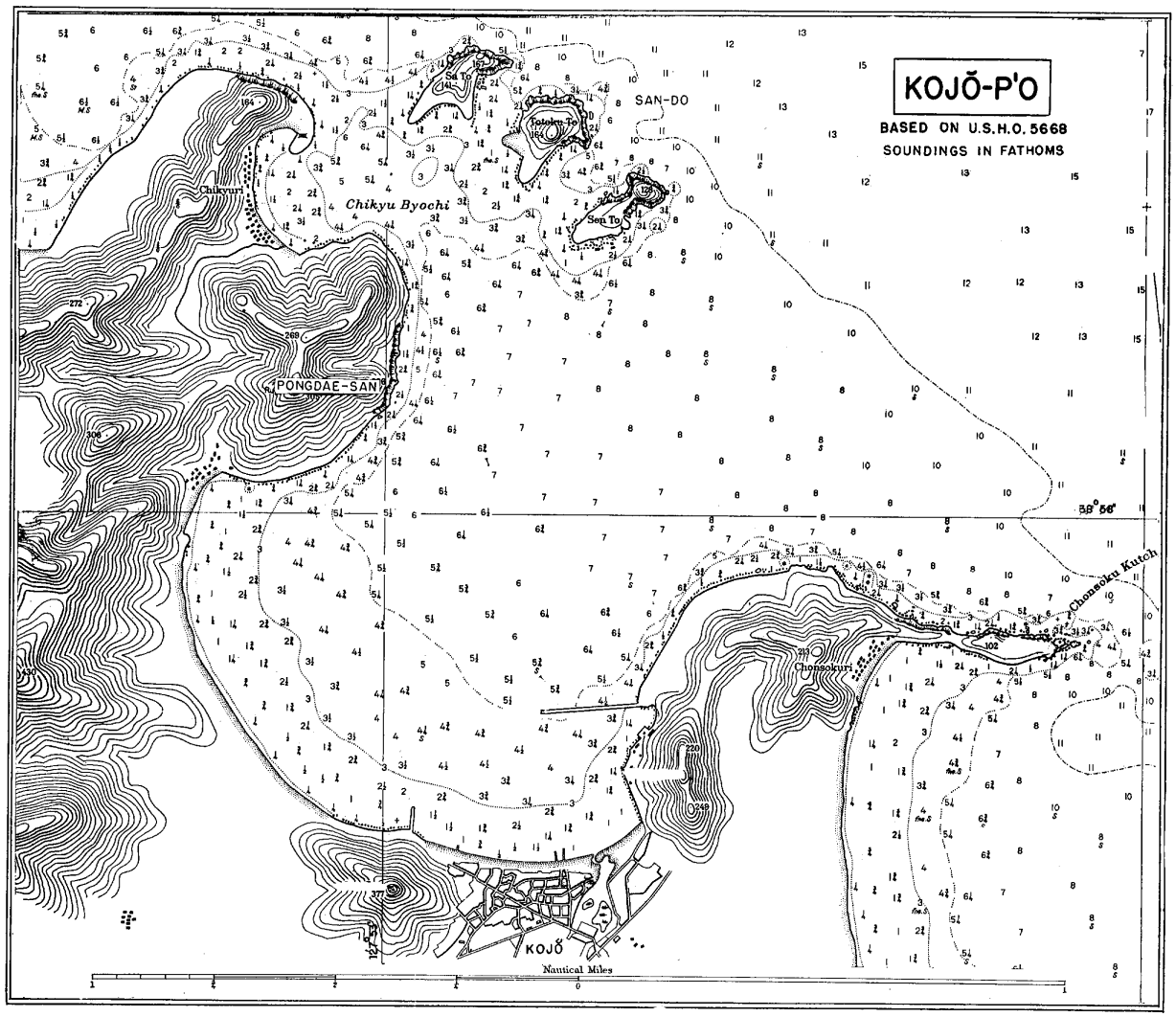

FIGURE VI - 54. *Kojo-p'o.*
Map of harbor.

sand, where the steamers of the Pusan - Wonsan line regularly anchor.

A little to the southeast of this anchorage there is a possible anchorage with a depth of 30 feet over sand, but the holding ground is not good.

During easterly winds anchorage can be obtained about a mile south-southwest of the northern extremity of Chongadae-dan, east of Changjon-hang, in depths of 42 to 48 feet, but the holding ground is not very good.

The entire harbor has room for 39 third-class anchorage berths.

The winds that periodically blow down from Kumgang-san, a well-known scenic mountain in the vicinity, are dangerous to shipping. These winds are strongest in April and May, and again in November and December. They usually begin in the afternoon and blow with great violence from between south-southwest and southwest; they then gradually veer, through west and north, to east, with a nearly constant force. These gales usually last from 1 to 3 days, but sometimes they begin very suddenly and blow strongly for only a few hours.

(2) Landing facilities.

Only one of the many piers in the harbor appears to provide berthage for vessels larger than fishing boats. This pier—called the Transport Pier—is about 230 feet long and 40 feet wide, with an L-shaped extension that gives the head a width of about 60 feet. The charted depth off the head of the pier is 10½ feet, and vessels of over 200 tons can tie up here.

Westward of the Transport Pier there is another pier or jetty about 65 feet long and 40 feet wide. Its capacity and use are unknown.

Besides these, there are 32 small piers of various lengths at which fishing craft, motor boats, and whalers can dock.

Barges are pulled up directly on the sandy beach.

On the southwestern side of Ch'ongnyong-dan an area of about 6.5 acres has been reclaimed and is presumably quayed, but no reports concerning the use of this land are available.

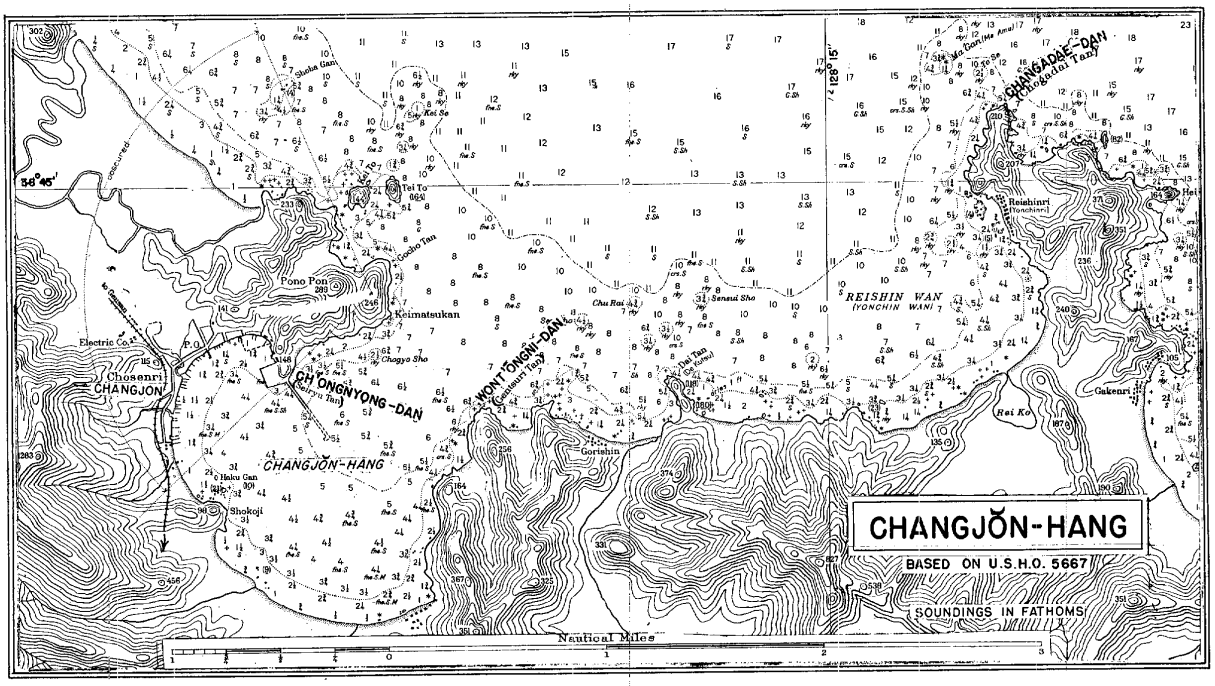

FIGURE VI - 55. *Changjon-hang.*
Map of harbor.

Along the eastern waterfront of Changjon-ni, at the base of Ch'ongnyong-dan, another tract of about 3.8 acres is being reclaimed.

(3) ***Capacity and clearance.***

In 1936, 19 steamships, totalling 8,536 tons, and 80 sailing vessels, totalling 1,627 tons, entered the port.

There are regular steamer connections with Pusan, Wonsan, and Japan.

Changjon is on the east coast railroad running southward from Wonsan and on the east coast highway, an improved road over 12 feet wide connecting the ports on the Sea of Japan and connecting with highways to cities on the west coast of Korea.

(4) ***Supplies.***

There are wells supplying water of good quality; but the supply is not abundant, and there is no equipment for supplying it to vessels.

Coal storage is small, and the small amounts of coal kept for current use are expensive.

I. Taep'o-ri and Sokch'o-ri (Tongch'o-ri).
(38°10′N, 128°36′E)

Taep'o-ri (Taihō-ri) is a small fishing harbor on the east coast of Korea about 122 miles south of Wonsan and 299 miles north of Pusan by rail (PLAN 11). Sokch'o-ri (Sokusō-ri, Tongch'o-ri) is another small fishing harbor about 2 miles northward of Taep'o-ri.

Taep'o-ri harbor has room for 2 first-, or 3 third-class anchorage berths. Sokch'o-ri outer and inner harbors together have room for 12 third-class anchorage berths and a lagoon entered

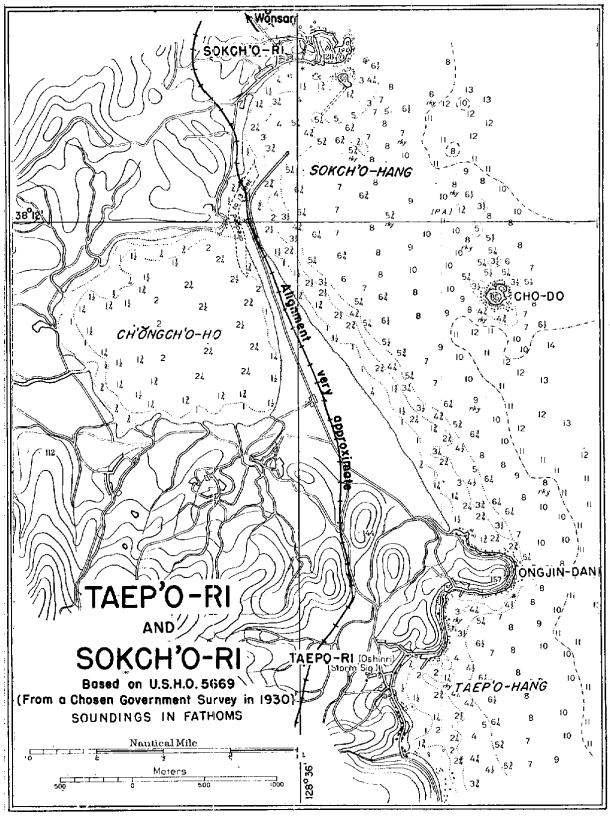

FIGURE VI - 56. *Taep'o-ri and Sokch'o-ri.*
Map of harbors.

through a 13-foot deep channel from the inner harbor has room for 6 third-class berths. Taep'o-ri has a pier in 12 feet of water, and a pier and small basin with less than 6 feet. No data are available on the existence of landing facilities at Sokch'o-ri.

(1) Harbor.

Taep'o-ri harbor is completely open between east and south. Assuming it to be delimited by a line drawn 195 from the tip of Ongjin-dan, it has an area of about 100 acres, and depths ranging from 17 to 48 feet. (FIGURE VI - 56). There is room for two first- or 5 third-class anchorage berths, with some protection against northerly winds.

Sokch'o-ri outer harbor is also open between east and south; it has room for 11 third-class anchorage berths with some protection against northerly winds. Sokch'o-ri inner harbor is protected by 2 breakwaters against all winds and has room for 1 third-class anchorage berth. A lagoon, Ch'angch'o-ho, just within the coastline, is entered from the inner harbor through a channel dredged to 13 feet. It could provide 6 third-class anchorage berths for vessels that could pass the entrance channel, and about 6 additional berths of 300 yards diameter in depths of 9 to 12 feet.

(2) Landing facilities.

Taep'o-ri harbor is divided into two parts by a broad-based headland projecting east-southeastward at about the center of the bay. On the southern side of this headland is a pier about 275 feet long, with a depth of 12 feet at its head. West of this pier, and also on the south side of the headland, is a small artificial basin, triangular in shape, about 150 feet by 125 feet by 50 feet, with a depth of 4½ feet.

In the northern part of the harbor, on the south side of Ongjin-dan, is a pier about 150 feet long with a depth alongside of less than 6 feet.

No data are available on the existence of landing facilities at Sokch'o-ri.

(3) Capacity and clearance.

No estimate of the maximum unloading capacity of Taep'o-ri or Sokch'o-ri can be made on the basis of available data. In 1930, the number of vessels docking at Taep'o-ri, exclusive of fishing vessels, was 220 steamers and 131 other vessels. An average of 26 to 31 fishing boats are based at Taep'o-ri. There are probably several fishing boats at Sokch'o-ri.

Taep'o-ri and Sokch'o-ri are on the east coast railway running southward from Wonsan, they are also on the east coast highway, an improved road more than 12 feet wide. Both the railway and highway are believed to bridge the entrance to the Ch'ongch'o-ho (lagoon). The steamships of the Wonsan - Pusan line dock at Taep'o-ri 9 times monthly, and there are occasional steamer connections with Unggi and Japan.

J. Chumunjin.

(37°53'N, 128°50'E)

Chumunjin-hang (Chūmonshin-kō) is a small bay on the east coast of Korea about 273 miles by rail north of Pusan and 148 miles south of Wonsan (PLAN 12). It is a small fishing port with 3 small piers. Between 1929 and 1936, the actual

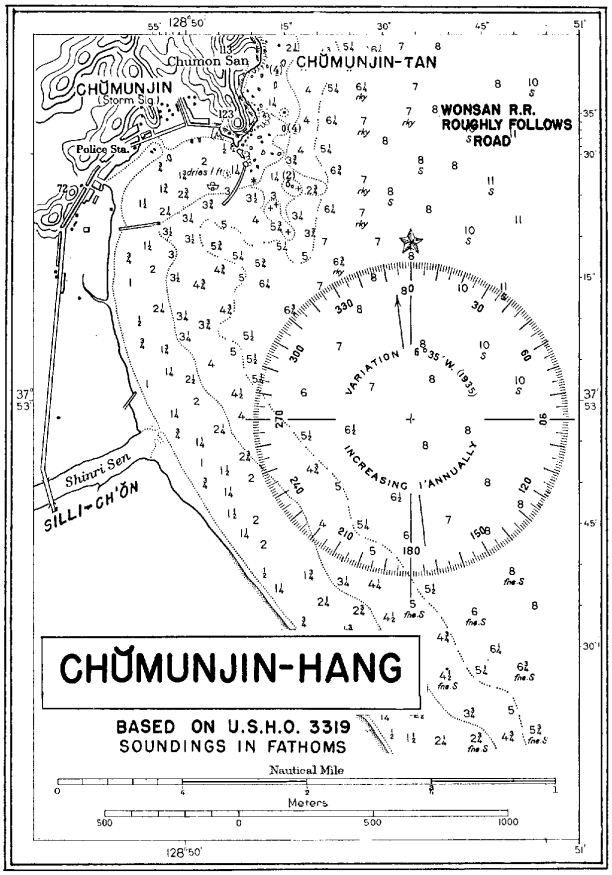

FIGURE VI - 57. *Chumunjin.*
Map of harbor.

annual traffic of the port jumped considerably, indicating probable development, but no data on improvements are available.

(1) Harbor.

The harbor consists of a natural outer harbor and an inner harbor with a water area of about 33 acres enclosed by a breakwater extending south-southeastward for about 600 feet from a point 1,350 feet south of Chumunjin-tan and by a groin extending 450 feet eastward from the western shore. (FIGURE VI - 57).

The entrance between the heads of the groin and breakwater is about 750 feet wide.

Both inner and outer harbor give good shelter from northerly winds, but strong easterly or southeasterly winds cause a heavy swell to set in.

The depth in the entrance to the inner harbor is 20 to 23 feet, decreasing within the harbor to 4½ feet at about 410 feet offshore. The part of the outer harbor available for anchorage has a depth of about 27 feet.

Anchorage can be obtained in the outer harbor 1,200 feet southeast of the bight on the head of the groin on the west in a depth of 27 feet over sand.

One third-class anchorage berth is provided by a mooring buoy in the inner harbor, about 300 feet northwest of the head of the breakwater.

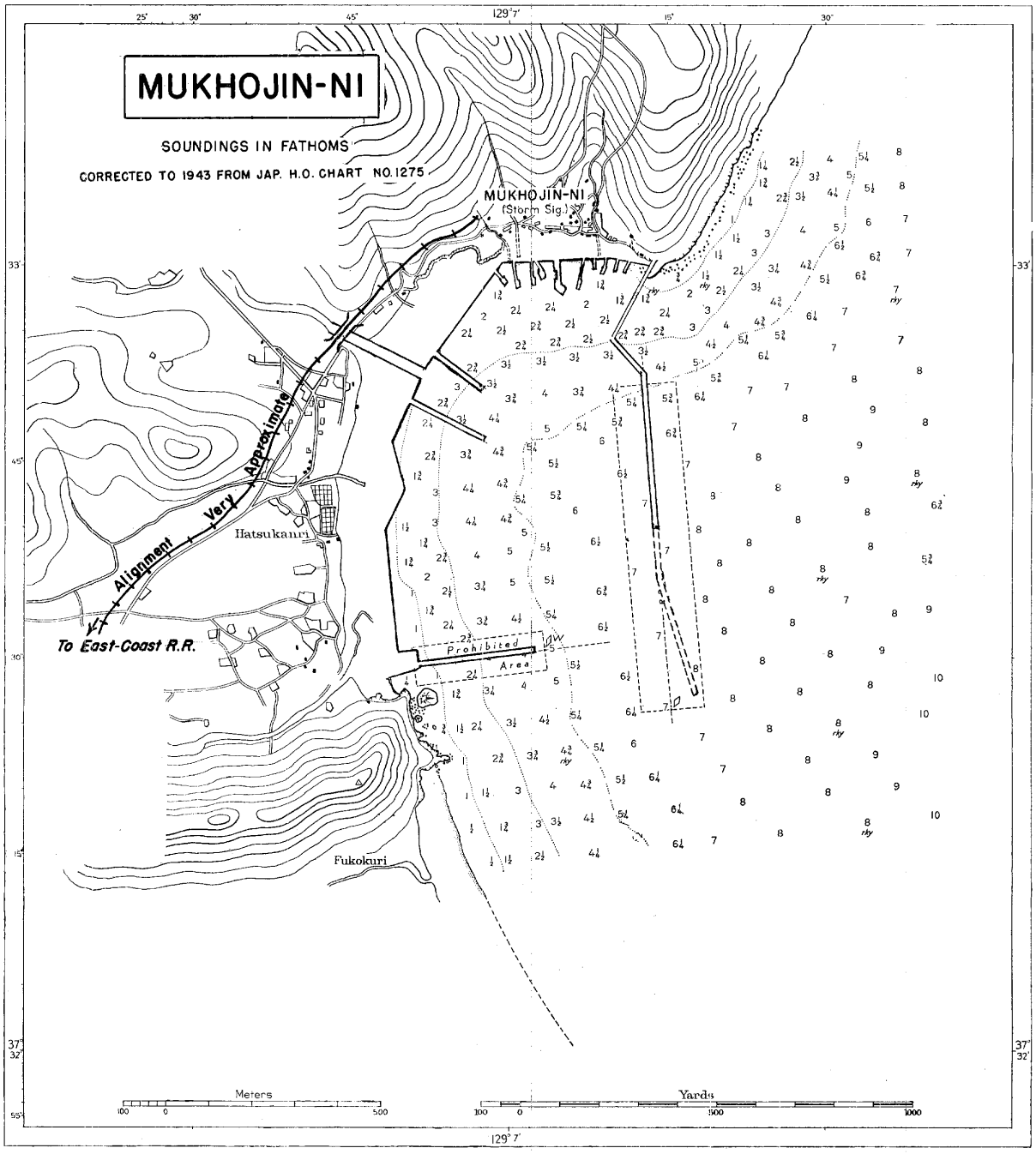

FIGURE VI - 58. *Mukhojin-ni.*
Map of harbor.

The mean high water interval in Chumunjin-hang is 2 hours, 52 minutes. Spring tides rise 1 foot, neap tides 8 inches. The mean tide level is 8 inches.

(2) *Landing facilities.*

Three small piers are reported to be along the waterfront of the village of Chumunjin, but nothing further is known of them.

(3) *Capacity and clearance.*

Use of the port has varied in recent years from 7,447 tons of shipping in 1929, when only 12 steamers and 409 sailing vessels visited the port, to 282,400 tons of shipping in 1936, when 465 steamers, aggregating 267,631 tons, and 795 sailing vessels, aggregating 14,769 tons, entered the port. The reason for this increase is not known, but it might indicate development. The ships of the Pusan - Wonsan line make regular stops at Chumunjin 9 times monthly.

Chumunjin is on the east coast railway between Pusan and Wonsan, and on the east coast highway, an improved road over 12 feet wide reaching other ports on the east coast and connecting with highways leading to the west coast.

(4) Supplies.

There are wells supplying water of good quality, but there is no equipment for supplying it to ships. During the winter, when well water is sometimes scarce, the inhabitants use water from the Silli-ch'on (Shinri-sen), although it is muddy. The quantity is not great.

K. Mukhojin-ni.
(37°33'N, 129°07'E)

Mukhojin-ni (Bokukoshin-ri) is a fishing port on the east coast of Korea (PLAN 13), and is one of the refuge harbors in the area. About 3 well-protected third-class anchorage berths are available. About 3,200 feet of open quays have depths from 4 feet to 13 feet alongside, and 10 piers have depths of about 8 feet alongside their heads. Large ships must anchor in the roadstead and work cargo by lighters.

(1) Harbor.

Mukhojin-ni is on a small bight which affords natural protection only from the north and west. Artificial protection has been added by 2 breakwaters which enclose the bight on the east and south. (FIGURE VI - 58)

The eastern breakwater runs generally southward for about 2,600 feet and it was planned in 1943 to extend it for another 1,300 feet. The southern breakwater runs eastward for about 800 feet. If the planned extension has not been carried out, the entrance width is 1,320 feet, but if the extension has been completed, the entrance width is 1,100 feet. The roadstead outside the breakwaters has suitable depths for large ships and the holding ground is good, but it is unprotected except from the west. Within the breakwaters, depths range from 13 to 39 feet and there is room for about 3 third-class anchorage berths, over good holding ground.

On either side of the mouth of the stream which enters the harbor on the northwest side, training walls 600 feet and 400 feet long have been constructed.

Tides rise about one foot, and the mean high water interval is 2 hours, 52 minutes. Tidal streams and currents in this area are negligible.

The region as a whole has the heaviest seas of the east coast of Korea; the seas are worst from November to March, when there are northerly winds. There is fog between May and July, and typhoons in November. A storm signal station is in the village.

(2) Landing facilities.

By 1943, the entire harbor was faced with reclaimed land, all of which was quayed or bulkheaded. About 3,200 feet of open quays have depths from 4 to 13 feet alongside. At the north end of the harbor, there are 10 piers of irregular shape, ranging from 60 to 150 feet in length, with depths of about 8 feet alongside the heads. Cargo from large ships must be handled by lighters.

(3) Clearance.

Mukhojin-ni is served by a spur from the east coast railroad, which runs southward from Wonsan, and it is connected with the east coast highway by a small, unimproved road.

L. P'ohang-dong.
(36°03'N, 129°22'E)

P'ohang-dong (Hokō-dō), about 100 miles north-northeast of Pusan, is a relatively important fishing harbor on the southeast coast of Korea (PLAN 14). A bay, open to the northeast, can provide about 5 first-, 18 second-, and 35 third-class anchorage berths. The landing facilities are on both sides of a river which flows into the bay near the anchorage area. Breakwaters protect the mouth of the river. The village waterfront on the left bank of the river is quayed with depths of 6 to 13 feet alongside; small piers with 6 feet of water, or less, at the heads are along the opposite bank. The unloading capacity of the port has been estimated at 2,500 long tons of general cargo per day discharged via lighters from 5 Libertys riding at anchor.

(1) Harbor.

P'ohang-dong is on the west side of Yongil-man, a 5-mile-square bay open to the northeast (FIGURE VI - 59). The only area available for anchorage lies off the north mouth of the Hyongsan-gang. The best bank of this river has been bulkheaded and filled and provides an area for loading and unloading harbor craft. The anchorage area provides 5 first-, 18 second-, and 35 third-class anchorage berths and has a fine holding ground of mud and sand. Japanese destroyers have anchored 1,200 yards from the lighted beacon at the end of the northern breakwater, bearing 109°. Fishing gear spread throughout the bay constitutes a navigational obstruction. A net-free lane for entering port was marked.

At the northern mouth of the Hyongsan-gang, there are 2 breakwaters. The northern one extends 720 feet from reclaimed land; the southern one extends 660 feet from the flats at the river mouth. The 2 breakwaters are 375 feet apart at the narrowest point. From the breakwaters to the town, the river mouth has been dredged to a least depth of 8 feet and a least width of 60 feet; the length is about 6,400 feet.

Yongil-man is protected from the southern winds of summer, but from November to April the bay is swept by strong winds from the northeast. At this time, it is difficult for small craft to navigate the entrance. During October and November, strong west winds cause ground swells. Storm signals are displayed to the west of Haksan-dong, the village just west of the breakwaters. The bay does not freeze over, but there is occasionally ice on the Hyongsan-gang. The area, generally, has the least fog of the central east coast. Information on tides and currents is lacking.

(2) Landing facilities.

The landing facilities in P'ohang-dong are used by fishing boats and by lighters servicing ships moored in the offing. There were 20 lighters and 2 tugs for this purpose.

Reclaimed land fronts on the north and west banks of the Hyongsan-gang. Outside the breakwater, there are 660 feet of open quay with depths of about 6 feet alongside 240 feet and depths of 4 feet alongside the remainder. Immediately inside the breakwaters there are 1,100 feet of open quay with depths

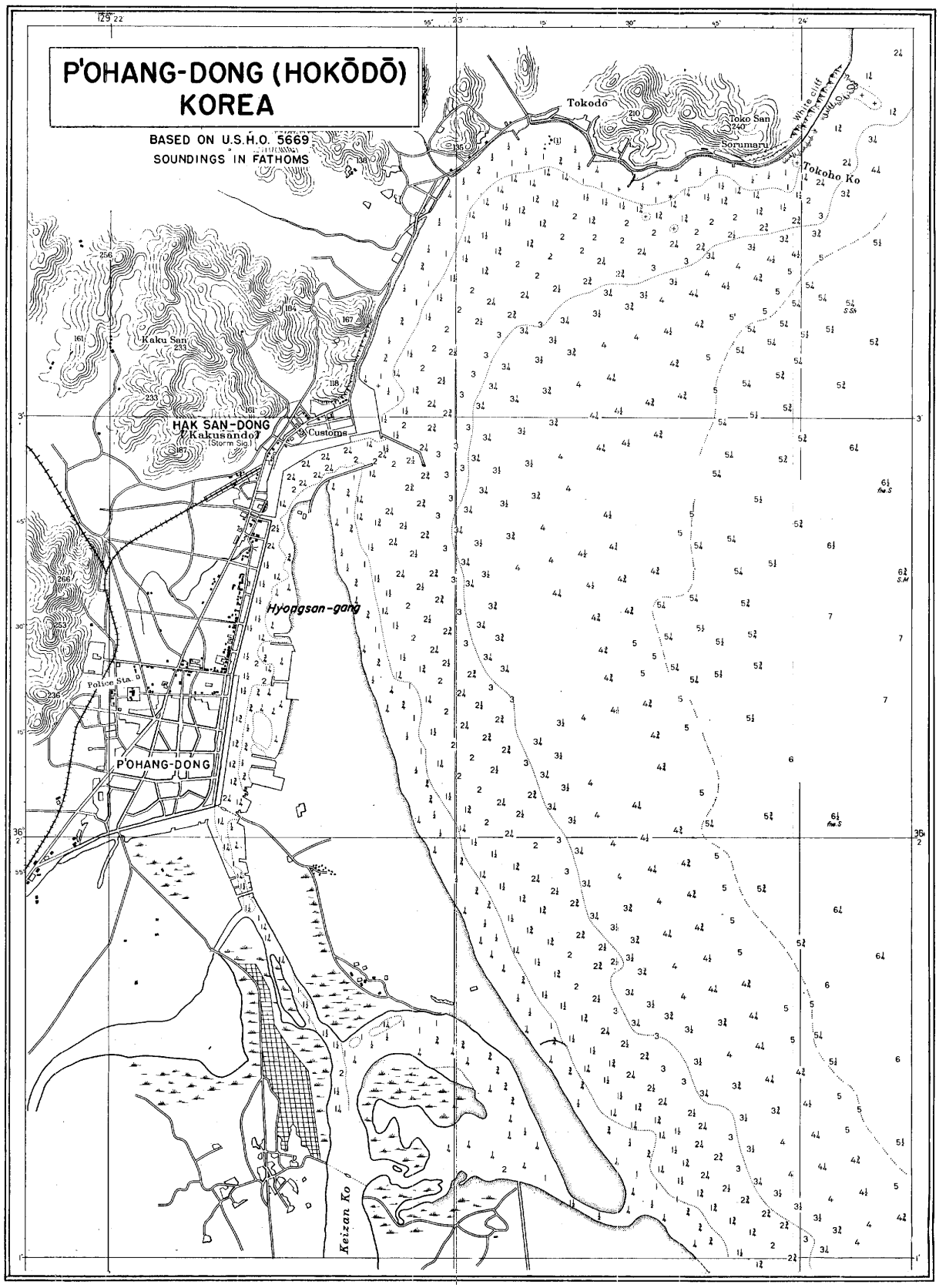

FIGURE VI - 59. *P'ohang-dong.*
Map of harbor.

of 13 feet alongside. Opposite this quay is the Haksan-dong branch customs office. Adjacent to this is 700 feet of quay which faces immediately upon a 45-foot strip of road and reclaimed land, having depths of 1½ to 6 feet alongside, but it is not known whether this has landing facilities. Next there is about 4,100 feet of open quay with depths of 8 to 13 feet alongside.

The town of P'ohang-dong is back of the southern portion of this reclaimed land. On the opposite side of the river, extending from flats are 5 piers averaging 280 feet in length with depths of 6 feet or under alongside the ends of the piers. South of these there are 12 piers of less than 60-foot length. Depths alongside these are 6 feet or less. All the above piers, constructed of wood, are presumably used only by the smaller fishing boats.

(3) Capacity and clearance.

The unloading capacity of the port for general cargo by ship's gear has been estimated at 2,500 long tons per day, discharged from 5 Libertys riding at anchor.

The east coast highway passes through P'ohang-dong. It is also on the east coast railway, and a spur runs from P'ohang-dong to Haksan-dong. The port is served by coastal steamer lines connecting it with Japan.

In 1940, 449 steamships, totaling 185,488 tons, and 2,232 sailing vessels, totaling 98,788 tons entered the port.

(4) Supplies.

A 1,000-ton capacity coal depot and several storage facilities for petroleum and light oil are in P'ohang-dong. There are waterworks and the water is of good quality, suitable for drinking and for use in ships. There are no water barges, but there is a small feed-pipe which supplies fishing boats.

(5) Repair facilities.

There are 4 shipyards where small motor boats and fishing vessels can be repaired, but their locations are not known.

M. Kuryongp'o-ri.
(35°59'N, 129°33'E)

Kuryongp'o-ri (Kyūryūho-ri), a small fishing port on the northeast coast of Korea, is on the north side of the semicircular bight about 69 miles northeast of Pusan (PLANS 14 and 15). An estimated maximum of 3 third-class anchorage berths are available in good protection but over poor holding ground. There is a pier with 17 feet of water near its head; 420 feet of open quays have 10-foot depths alongside, and 1,530 feet have depths from 2 to 4 feet alongside.

(1) Harbor.

The harbor opens southeastward (FIGURE VI - 60). A 1,470-foot breakwater extends southwestward across the northern half of the harbor mouth. On the north side of the harbor is an extensive reclaimed area, all of which is quayed or bulkheaded; and on the west side are 3 training walls, which offer additional protection to the main part of the port from swell, currents and drifting sand.

The protected area can provide an estimated maximum of 3 third-class anchorage berths. However, it is probable that only small fishing vessels moor within the harbor; larger vessels obtain temporary anchorage outside the breakwater. Within the breakwater, the maximum depth is 33 feet. The sand and rock bottom makes poor holding ground.

There is no specific information on tides, currents, or local weather.

(2) Landing facilities.

Land has been reclaimed along the northern half of the harbor. There is a total of 1,950 feet of open quays: 420 feet with 10-foot depths alongside, and the remainder with from 2- to 4-foot depths alongside. This reclaimed area is probably used for the handling of cargo by small vessels and for fishing craft moorings. Three hundred yards west of the north end of the breakwater, a pier, 150 feet long and 45 feet wide, extends southwestward. Depths are 17 feet near the head of the pier.

(3) Capacity and clearance.

In 1936, 17,135 steamships of 599,725 tons and 34,618 sailing vessels of 384,285 tons entered the harbor.

From Kuryongp'o-ri, a narrow, improved road runs westward to P'ohang-dong (Hokō-dō) (Topic 62, L), where it connects with the east coast highway and with the railroad running north from Pusan.

N. Kamp'o-ri.
(35°48'N, 129°31'E)

Kamp'o-ri (Kanho-ri), a fishing port, is in a small cove on the southeast coast of Korea about 50 miles north of Pusan (PLAN 15). An estimated 4 third-class anchorage berths are available within the harbor breakwaters. Larger vessels may anchor outside the harbor but protection is small. Three small piers and about 230 yards of quayage have depths from 5 to 8 feet. The estimated unloading capacity is 1,000 long tons per day worked in the stream by 2 Libertys at anchor; anchorage would be possible only in moderate winds or calm.

(1) Harbor.

The harbor is protected from the north and west, and breakwaters which extend from either side of the entrance give some protection from the south and east, but are not effective against storms. If the northern breakwater, under construction in 1941, has been completed, the width of the entrance between the 2 breakwaters is 110 yards (FIGURE VI - 61). In front of the main settlement in the southwest section of the harbor, considerable land has been reclaimed behind bulkheads. These bulkheads and a few small piers are the principal landing facilities of the port. Two training walls at the mouth of the stream which enters at the north of the cove were completed in 1943.

An estimated maximum of 4 third-class anchorage berths with a coarse sand bottom are available within the breakwaters. Depths range up to 24 feet. Kamp'o-ri harbor is generally crowded with small craft, and although a second-class destroyer has possibly entered, small coastal steamers are the largest vessels which ordinarily go inside the breakwaters. Larger vessels may anchor outside the harbor, but protection is small. Best anchorage here is about 600 yards southeast of the end of the south breakwater. This anchorage has depths of 60 feet, with a good holding ground of sand.

In summer a south wind prevails; in winter, the west wind is severe, bringing squalls. Storm signals were displayed at a

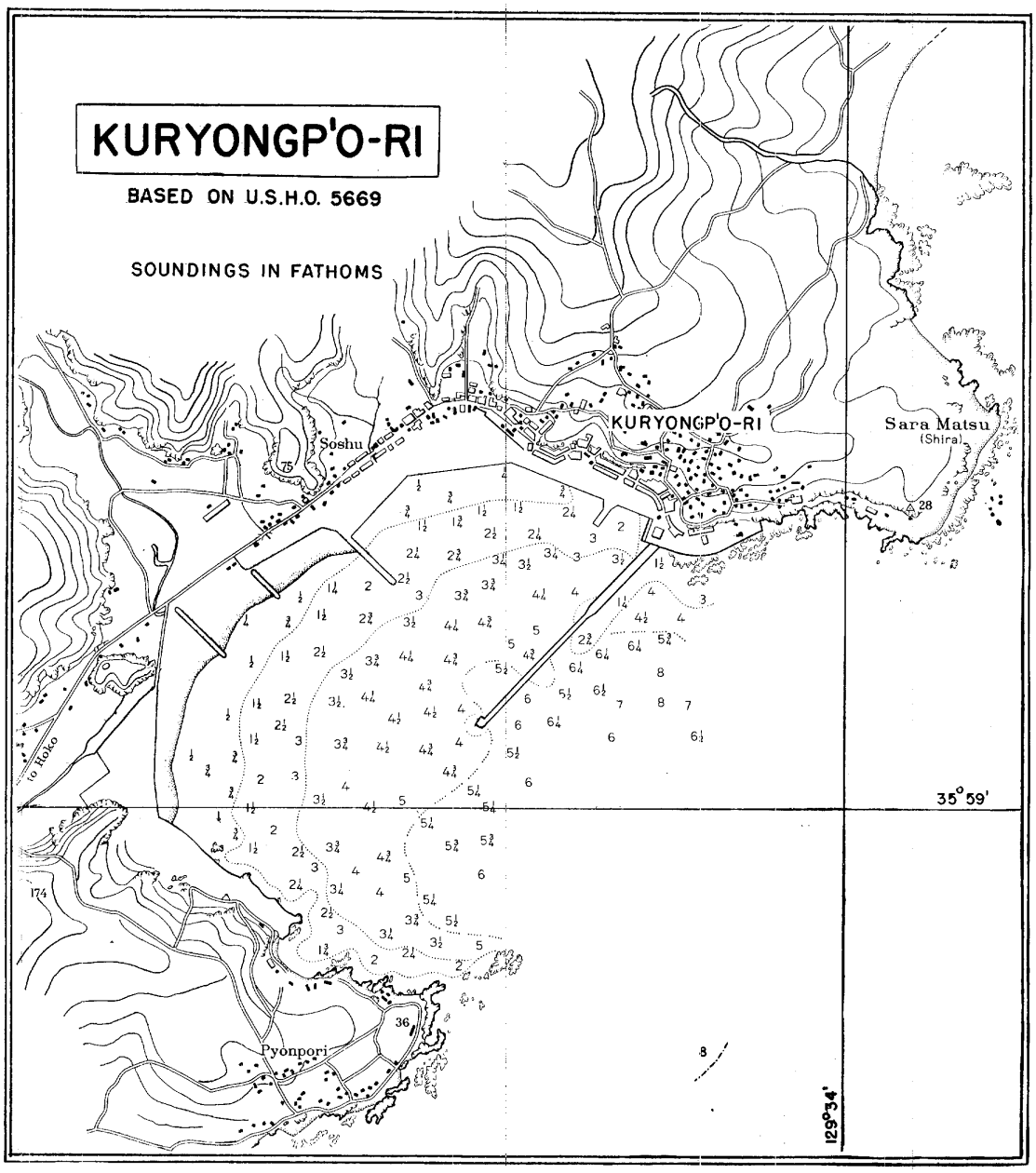

FIGURE VI - 60. *Kuryongp'o-ri.*
Map of harbor.

point to the west of the center of town. The atmosphere, on the whole, is dry, and temperatures are moderated by a warm ocean current. Tidal information is not available.

(2) ***Landing and storage facilities.***

The shores of the southwest part of the inner harbor consist of reclaimed land faced by bulkheads or quays. Fronting on the rest of the cove, to the north, there is about 900 yards of beach, the western part of which, near the town, presumably is used for hauling out fishing craft.

The bulkheads and quays of the reclaimed land have shallow depths alongside and are used only by fishing craft and by lighters for general cargo. About 230 yards have 13 feet alongside; about 100 yards have 8 feet; and about 100 yards have 5 feet. Three small piers project from the 230-yard stretch, and depths at their heads range from 13 to 15 feet.

The only building suitable for storage which is on or near the quays is a fish market behind the northernmost pier. Open storage space is provided by the reclaimed area.

(3) ***Capacity and clearance.***

In 1936, 20 steamships of 8,400 tons and 38,316 sailing vessels of 957,900 tons entered the harbor.

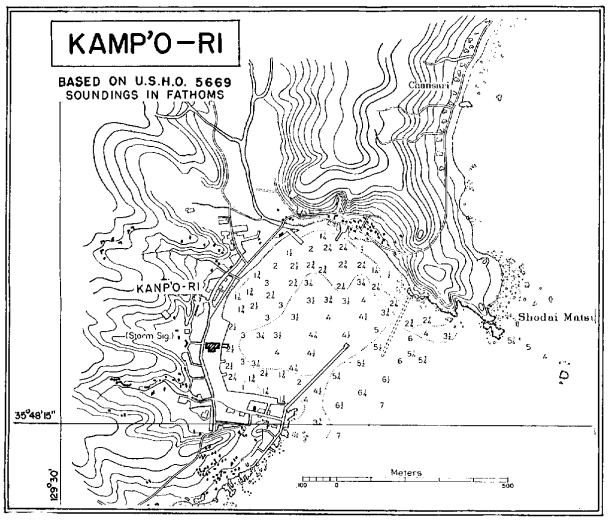

FIGURE VI - 61. *Kamp'o-ri.*
Map of harbor.

The unloading capacity of the port for general cargo by ship's gear has been estimated at 1,000 long tons per day, discharged from 2 Libertys riding at anchor; anchorage would only be possible in calm or moderate winds.

The town has no railroad connection. An improved road less than 12 feet wide leads south out of town and then runs inland to the west; an unimproved road runs north along the coast.

(4) Supplies.

It is probable that only small supplies of oil and coal are kept in Kamp'o-ri. The last available data indicated that the water came from wells and had a considerable salt content, but plans were being made for the laying of an aqueduct.

(5) Repair facilities.

There are 2 small yards where fishing craft were built. Their location is not known.

O. Pango-ri.
(35°29'N, 129°26'E)

The small fishing port of Pango-ri (Hōgyo-ri) is in a small bay on the southeast coast of Korea, about a mile east of the entrance to Ulsan-man (PLAN 15). Pusan is about 30 miles southwestward. Pango-ri is a base for southeast coast fishing vessels. Anchorage for 500-ton vessels is possible inside the harbor breakwaters. Vessels over 500 tons may obtain temporary, unprotected anchorage off the harbor. About 150 yards of quayage have depths up to 5 feet. A 20-foot wide wooden pier has 16-foot depths at its head and there are 4 smaller piers; all 5 piers are usable by small craft only. Deep-draft vessels anchor outside the breakwater and are unloaded by harbor craft.

(1) Harbor.

Pangosin-hang (Hōgyoshin-kō, Pango-ri harbor) is a small southward-facing bay, about 700 yards by 500 yards, the western part of which is protected by a 300-yard breakwater (FIGURES VI - 62 and VI - 63). The harbor is used primarily by fishing vessels, but anchorage for vessels up to 500 tons is possible inside the breakwaters. Depths range up to about

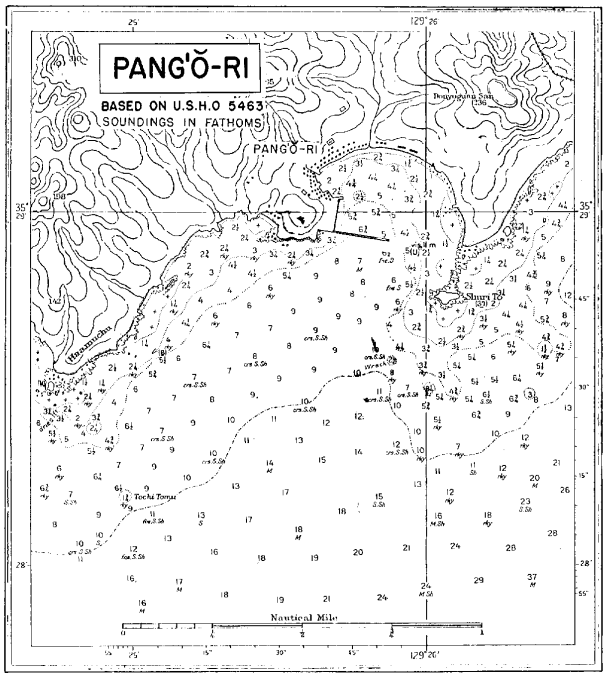

FIGURE VI - 62. *Pang'o-ri.*
Map of harbor.

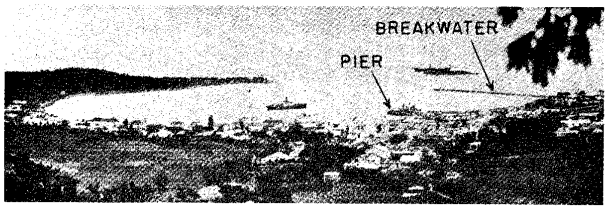

FIGURE VI - 63. *Pang'o-ri.*
Harbor, looking southward, showing pier and breakwater.

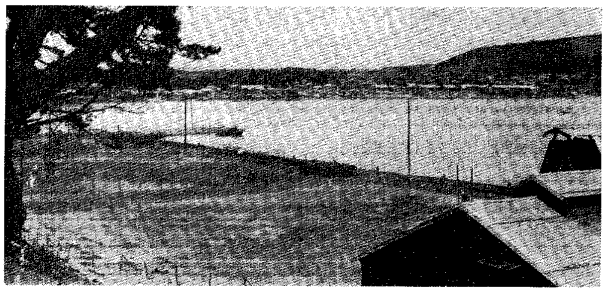

FIGURE VI - 64. *Pang'o-ri.*
Bulkhead and pier, looking northeastward.

35 feet, and the area of the harbor is estimated at 198,000 square yards. The bottom consists of sand and mud.

Vessels over 500 tons may obtain temporary, unprotected anchorage off the harbor about 650 yards southwest of the head of the breakwater. Depths here are approximately 50 feet, with a mud and sand bottom.

The mean high water interval is 7 hours and 20 minutes; springs rise almost 2 feet and neaps 1.3 feet. Offshore, the current sets northward with a maximum rate of almost 1 knot. It

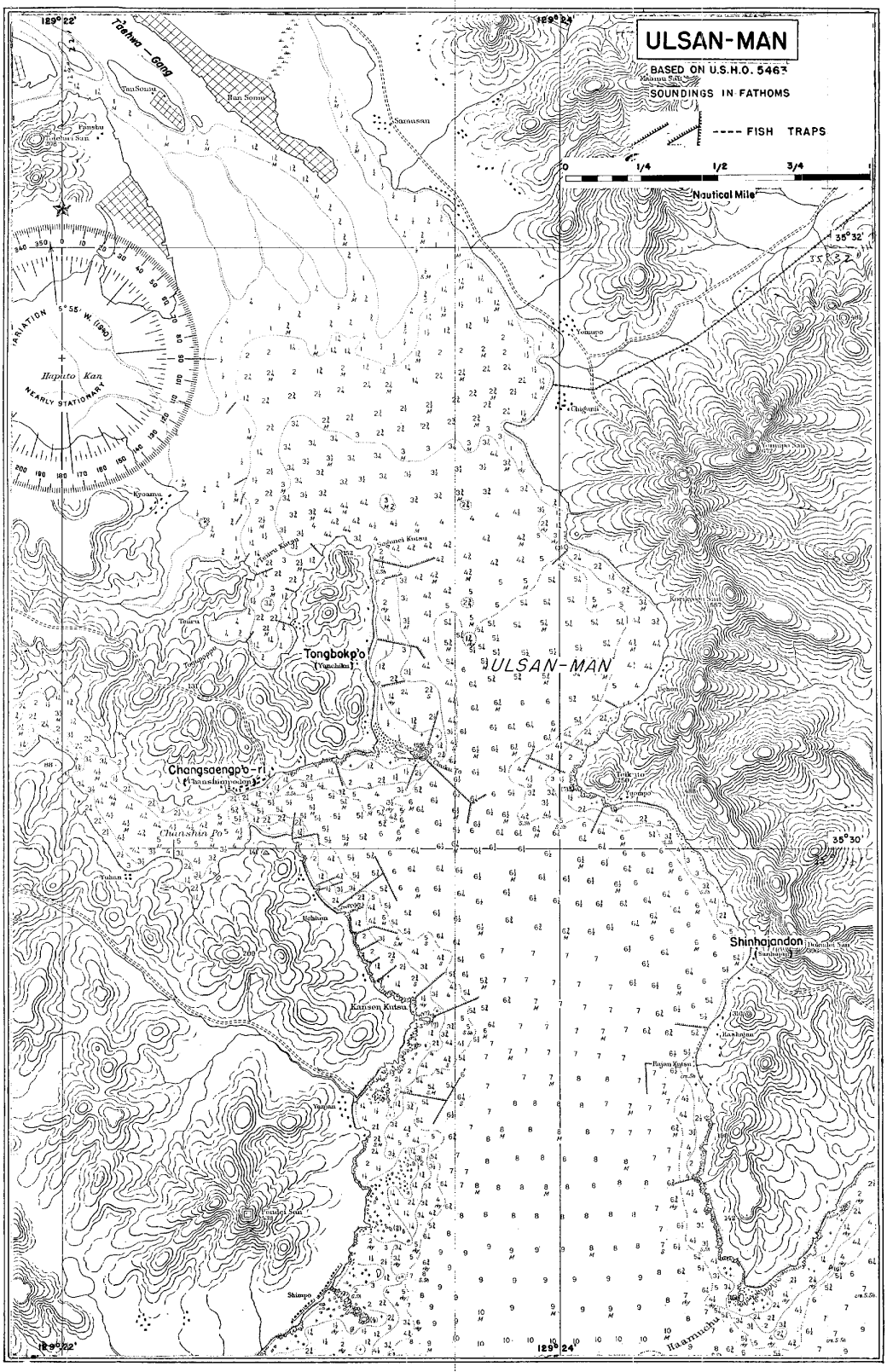

FIGURE VI - 65. *Ulsan-man.*
Map of harbor.

is strongest in summer. Information concerning local weather conditions is not available. Storm signals were displayed from the rear light of the western pair of range lights.

(2) Landing and storage facilities.

In the southwest part of the harbor close north of the breakwater, the shore has been filled in for about 300 yards (FIGURE VI - 64). Depths alongside about 150 yards range up to 10 feet, and alongside the remaining 150 yards up to 5 feet. From the north end of the bulkhead, a wooden pier about 16 feet long and 20 feet wide projects in a northeast direction. Depths alongside the head of the pier are believed to be about 16 feet, along the northwest side 5 feet, and along the southeast side 10 feet.

There are 4 smaller wooden piers. All 5 piers are usable only by small craft.

The north side of the bay is surrounded by gently sloping sandy beaches upon which fishing vessels can be hauled out. The eastern side is rocky and not accessible.

Unloading of ships anchored outside the breakwater is accomplished by harbor craft. Storage facilities are limited to a few small fish storage buildings and fishing gear sheds.

(3) Capacity and clearance.

In 1936, 36 steamships of 3,805 tons and 16,253 sailing vessels of 302,559 tons entered port.

Pango-ri has no rail connections, although the main line passes through Ulsan, some 10 miles to the northwest. An improved road less than 12 feet wide leads from Pango-ri to Ulsan where it connects with the east coast road.

(4) Supplies.

On the western side of the harbor, there is a tank for heavy oil. A small pipeline supplies water of good quality to fishing craft. Other than this, there is only a small quantity of well water of a poor quality.

(5) Repair facilities.

Two iron foundries, capable of simple repairs on internal combustion motor boats, were located in Pango-ri.

P. Ulsan-man.
(35°30'N, 129°24'E)

Ulsan-man (Urusan-wan), on the southeast coast of Korea, is directly west of Pango-ri harbor and is between 30 and 35 miles north-northeast of Pusan (PLAN 15). Though mostly undeveloped, it is a large anchorage, open only to the south, and providing 15 first-, 11 second-, and 40 third-class anchorage berths.

The town of Ulsan itself is 4 miles up the T'aehwa-gang (river) from the coast. The river consists of mud flats and shallow water, making it impossible to load or unload at the town. Landing facilities have been developed at Changsaengp'o-ri, 4½ miles by road from Ulsan. Changsaengp'o-ri is on a narrow arm, Changsaeng-p'o (Chanshin-po), opening off the southwest side of Ulsan-man. It has about 1,250 feet of quayage with depths alongside of 6 to 13 feet. The estimated unloading capacity is 1,000 long tons worked by lighters at Changsaengp'o-ri from 2 Libertys at anchor.

(1) Harbor.

Ulsan-man is about 3½ miles long by about 1 mile wide, and provides about 15 first-, 11 second-, and 40 third-class anchorage berths (FIGURE VI - 65). It is protected against storms, except from the south where it is open. Depths range up to about 50 feet and the bottom consists largely of mud.

Changsaeng-p'o is about 400 yards wide off Changsaengp'o-ri, and has central depths of over 30 feet, and excellent holding ground. It can provide anchorage for small coastal vessels and whalers (FIGURE VI - 66). It affords protection from the south which is lacking in Ulsan-man proper. A cove near the village of Tongbokp'o (Tobokuho), across the peninsula from Changsaengp'o-ri, is used as a shelter for small craft. It has central depths of 15 to 20 feet, and good protection.

Fish traps set up permanently along the coast outside Ulsan-man and temporarily (September through March) from the mouth of the bay inward constitute obstacles to vessels entering and leaving Ulsan-man.

FIGURE VI - 66. *Ulsan-man.*
Small ships at anchor in Changsaeng-p'o (Chanshin-po), looking southeastward from hills behind Changsaengp'o-ri.

The mean high water interval is 7 hours and 20 minutes; springs rise almost 2 feet, and neaps 1.3 feet. Within Ulsan-man, the flood tide is always slack, and after a heavy rain the strengthened current of the T'aehwa-gang completely neutralizes the effect of the tide. A mile or so off the coast outside the bay, the ebb tide current flows northeast at 2 knots and the flood tide current flows southwest at 1.3 knots. Information concerning local weather conditions is not available. Storm signals were displayed west of Changsaengp'o-ri.

(2) Landing and storage facilities.

The only landing facilities are at Changsaengp'o-ri (FIGURE VI - 67), where there are about 1,250 feet of reclaimed land faced by a bulkhead. Depths alongside are from 6 to 13 feet. The structures immediately back of the waterfront may be storage sheds. The only other storage facilities are believed to be at Ulsan.

Local fishing vessels are hauled out on the sandy beach at Shinhajandon, on the east shore of Ulsan-man.

(3) Capacity and clearance.

The unloading capacity for general cargo by ship's gear has been estimated at 1,000 long tons per day, worked by lighters at Changsaengp'o-ri from 2 Libertys riding at anchor.

Changsaengp'o-ri is connected with Ulsan by a 4½-mile unimproved road. Ulsan is served by the east coast secondary highway from Pusan and by the east coast railroad from Pusan.

FIGURE VI - 67. *Ulsan-man.*
Wharves and warehouses at Changsaengp'o-ri, looking southward.

Q. Chisep'o, Changsung-p'o, and Nung-p'o.

(about 34°51'N, 128°44'E)

Chisep'o, Changsung-p'o (Chōshō-ho), and Nung-p'o (Ryō-ho) are 3 small bays on the east side of Koje-do, an island off the entrance to Chinhae-man on the southeastern coast of Korea (PLAN 19). They are within 3 miles of one another, and are mainly fishing harbors and harbors of refuge. Together they provide about 31 third-class anchorage berths. Nung-p'o has a pier in 28 feet of water which can accommodate vessels up to 7,500 tons. Chisep'o has a pier in 16½ feet of water and another in 11 feet. Other landing facilities in the 3 harbors are for small craft only.

(1) *Harbor.*

(*a*) *Chisep'o.* The entrance to the bay is open eastward, but the greater part of the inner harbor affords good shelter against all winds. Its water area, within a line drawn between Kanggu-gak (Kōkō-kaku, Kanguchi-kō) and Ho-ōm (Ko-gan, Yanchipao), is about 730 acres, with room for about 26 third-class anchorages (FIGURES VI - 68 and VI - 69).

Depths in the entrance are 54 feet to 66 feet, decreasing within the bay to 18 feet at a distance of about 180 to 520 feet from shore on the northeast side of the bay and 600 to 900 feet from shore on the southwest side. The bottom is mud, with shell in a few places.

(*b*) *Changsung-p'o.* Changsung-p'o is a natural harbor which has been improved by the construction of 2 breakwaters extending roughly northeastward and southwestward from the shore on opposite sides of the bay near its mouth. The area within the breakwaters is about 85 acres, with shelter from all winds. (FIGURE VI - 68).

The greater part of Changsung-p'o has a charted depth of 10½ feet, with a depth of 12 feet at the entrance.

(*c*) *Nung-p'o.* The bay is open northward but affords good shelter against winds from other directions. Within a line drawn westward from Yangji-amch'wi (Yōchi-ganshi), the northeastern entrance point, it comprises about 200 acres, with room for about 5 third-class anchorage berths.

The depth is 59 feet at the entrance to Nung-p'o, decreasing to 28 feet at about 100 yards from shore.

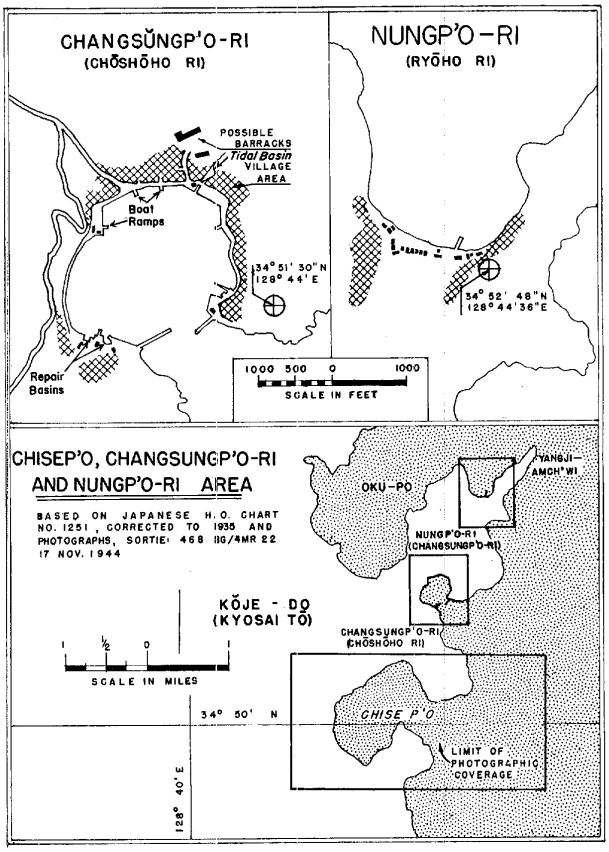

FIGURE VI - 68. *Chisep'o, Changsungp'o-ri, and Nungp'o-ri.*
Sketch of area showing portions covered by individual sketches, and individual sketches of Changsungp'o-ri and Nungp'o-ri.

(2) *Landing and storage facilities.*

(*a*) *Chisep'o.* At the northern end of the bay, along the village of Churimp'o (Shurimpo, Sairimpo), is a considerable bulkheaded frontage, which is probably used for small craft landing and mooring. There is also a pier about 120 feet long with a depth of water of 11 feet at its head.

About three-fourths of the northwest shore of the peninsula forming the southeastern side of the bay has been bulkheaded and may be usable in part as a boat landing. Toward the northern end of this bulkheaded shore, at the village of Sonch'ang-dong (Senchan-ri, Sensō-dō) are 2 piers. The northernmost is about 197 feet long and has a depth of water at its head of 16½ feet. The other is about 66 feet long with a depth alongside of about 1 foot.

Toward the southern end of the bulkheaded shoreline are some stone steps and a boat landing, with a pier about 120 feet long in shoal water, about 1 foot deep.

There appears to be another landing at a third section of bulkheaded shoreline on the west side of the bay, at the village of Taedong-ni (Taidō-ri, Daidō-ri), but it is dry alongside at low tide.

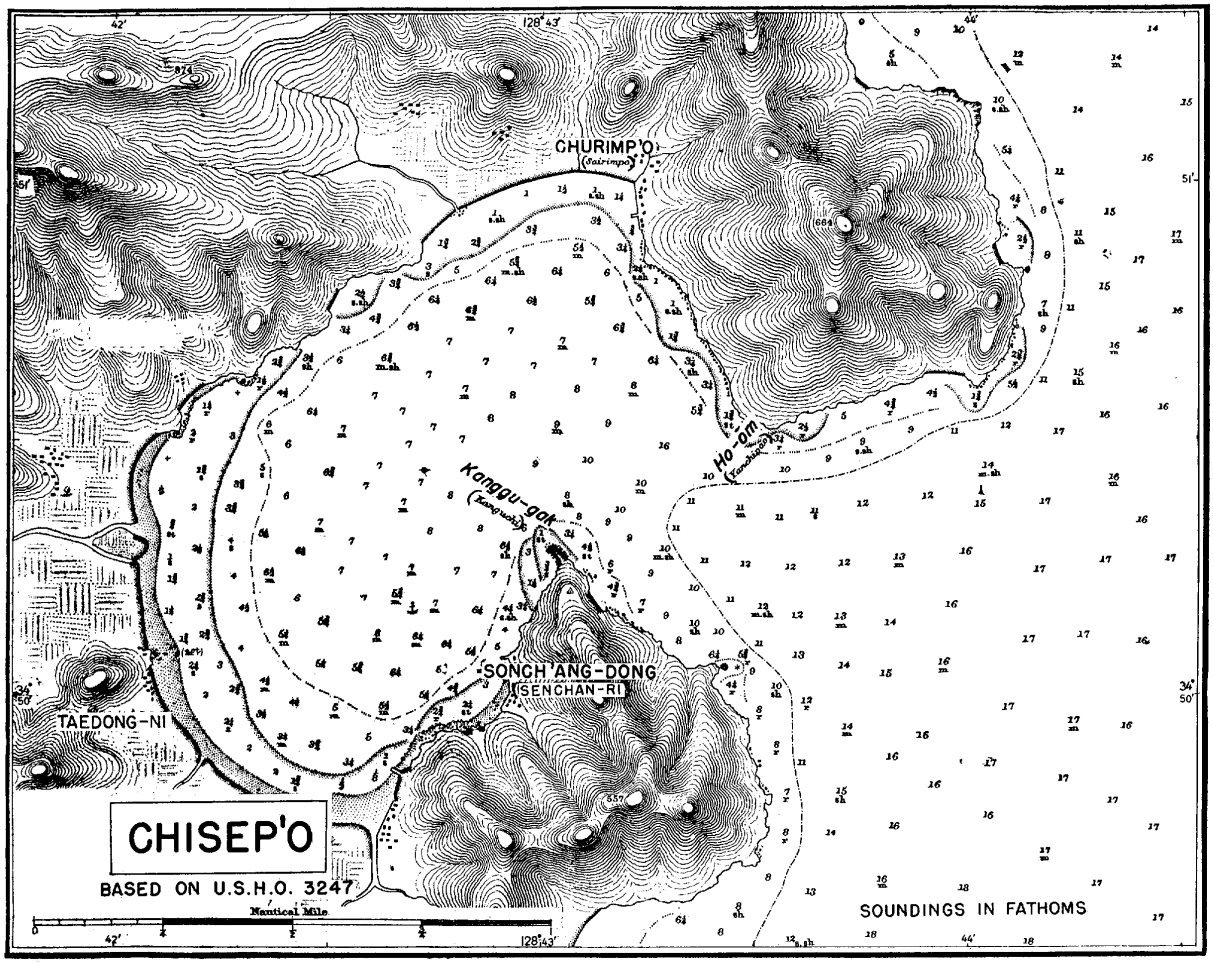

FIGURE VI - 69. *Chisep'o, Changsungp'o-ri, and Nungp'o-ri.*
Map of Chisep'o harbor.

(*b*) *Changsung-p'o.* Changsung-p'o has its main pier on the south side of the bay. The pier extends 100 feet from shore, and at the face it is 16 feet wide and has a chartered depth of about 4 feet.

A quay with three faces totalling 410 feet is near the mouth of the harbor, just within the east breakwater. It appears capable of accommodating 40-foot craft.

A second pier, 60 feet long and with a face 15 feet wide, is on the east side of the bay, toward its head. The depth off the head of this pier is about 3 feet.

On the northeastern side of the bay there is a sea wall through which a 15-foot-wide passage leads to a triangular tidal basin whose greatest dimensions are 60 by 140 feet. This basin is known to accommodate 20-foot craft.

At the quay near the mouth of the harbor are 4 buildings, the largest 40 by 55 feet, which may be warehouses. Air photographs showed loose stores and a small coal store on the quay.

On the south side of the bay is a shed 30 by 70 feet at a distance of 50 feet from shore behind a repair basin westward of the pier.

This harbor appears to be used mainly for fishing craft, the south side being devoted to repair and fitting out.

(*c*) *Nung-p'o.* Nung-p'o has one pier, at the head of the bay, at the village of Nungp'o-ri (Ryōho-ri). It is about 150 feet long and has a face 15 feet wide. It is known to accommodate 50-foot craft, and, since the water at the face is 28 feet deep, it can probably accommodate larger vessels.

There are 14 buildings that appear to be warehouses along the waterfront of Nungp'o-ri (Ryōho-ri): 11 are 20 feet by 34 feet; 2 are 30 feet by 70 feet; and 1 is 20 feet by 75 feet.

(*3*) ***Capacity and clearance.***

No information is available concerning the maximum possible capacity of these ports. Only small vessels can use Chisep'o and Changsung-p'o, but Nung-p'o has sufficient depth at its pier to accommodate vessels of up to 7,500 tons.

Clearance to the mainland is by water only.

(*4*) ***Supplies.***

It is believed that there may be 3 oil tanks, each 15 feet in diameter, on the south side of Changsung-p'o about 250 feet landward from the face of the pier.

A small coal supply has been observed on the quay on the west side of Changsung-p'o.

(5) Repair facilities.

At Changsung-p'o there is a 400-foot sea wall westward of the west breakwater. On this bulkhead there are facilities for repair of small boats up to 40 feet long.

Just westward of this sea wall, and eastward of the pier, is a basin used for repairs and possibly for construction of craft up to 40 feet long. There is a similar basin, also used for repair and possibly construction of craft of this size, westward of the pier.

On the west side of the bay, near its head, is a sea wall 370 feet long with a boat ramp 30 feet wide. Craft 55 feet long have been observed on the ramp and bulkhead.

Another sea wall, 1,170 feet long, occupies most of the north side of the bay. Two ramps, each 15 feet wide, lead into the water from it.

R. Masan.

(35°10'N, 128°33'E)

Masan is in southeastern Korea, 30 miles west of Pusan and 5 miles northwest of Chinhae, center of the Chinkai Naval District (PLAN 18). Because Masan is within the naval district, information on its port facilities is meager. Harbor and port facility improvements have been planned and some construction has been started. Masan itself extends for about 2 miles along the western bank of the harbor; a short distance northward of Masan is an older town, Kumsan. Both have landing facilities.

The protected harbor can provide about 16 second- and 41 third-class anchorage berths and the water area southward of the harbor limit can provide about 18 first-class anchorage berths. There are no landing facilities for ocean-going vessels; depths alongside the 2 main piers are 14 and 15 feet. Facilities reported under construction may have deeper dredged depths alongside. The estimated unloading capacity is 7,500 long tons per day, serviced by lighters from the first-class anchorage berths southward of the harbor.

(1) Harbor.

Masan harbor extends northward from the narrows immediately south of Cho-do (Cho-tō, Cho Somu) to the mud flats north of Kapso-mal (Kōsho-matsu, Kagu Nyo Kutsu), an enclosed water area of approximately 1,300 acres with depths from 6 to 42 feet (FIGURE VI - 70). While the southern harbor limit is conventionally defined as the line joining Isim-mal (Ishin-matsu, Ishimi Kutsu) and Kajiduri-mae (Kachitori-mae, Manjimorin Kutsu), the water area south of this line down to The Gate off Somo-do, a distance of 2½ miles, can also be considered as part of Masan harbor. Port facilities are all on the western side of the harbor; the harbor is protected from wind and sea.

(a) Entrance channel. The approach to Masan is the same as the approach to the Chinkai Naval Station—from Chinhae-man through Kadok-sudo (channel) thence via Pudo-sudo (channel) to The Gate (described in greater detail in Chapter XIII). From The Gate, the channel proceeds northward between Somo-do and Makkae-do (Bukukai-tō, Carpenter Rock) into Masan harbor, a distance of 2½ miles with minimum width 600 yards and minimum depth 36 feet.

(b) Anchorage. The anchorage is approximately 1½ miles long east and west and 1 mile wide north and south and has an area of approximately 1,000 acres with depths from 6 to 42 feet. Vessels can anchor safely in any part of the harbor, which can provide about 16 second- and 41 third-class anchorage berths.

The channel from The Gate to the southern harbor limit can also be used as an anchorage without difficulty. This anchorage, covering a water area of approximately 800 acres with depths from 36 to 84 feet, can provide about 18 first-class anchorage berths.

The bottom throughout is mud.

(c) Significant hydrographic features. The mean high water interval at Masan is 8 hours and 19 minutes, springs rise 6.2 feet, neaps rise 4.6 feet, and mean sea level is 3.3 feet above datum. Tidal differences on Pusan are +0 hours and 20 minutes for high and low water, and the tidal ratio is 1.55.

(d) Local weather. Winters are cold, dry and bracing, while the summer heat is somewhat tempered by sea breezes. January is the coldest month, the mean monthly temperature being 35° F. August is the warmest month with a mean temperature of 77° F. The rainy season is April to July. Fogs occur from April to August. Snow is seldom seen. Winds are generally moderate.

(2) Landing facilities.

Landing facilities extend the length of the western side of the harbor and from Kumasan to Masan, a distance of 2 miles, but none of these facilities are for ocean-going vessels. At Masan, the waterfront centers about the customs pier (Reference ②*), and at Kumasan, about the Won-jong (Gen-chō Genwachi) basin (Reference ⑦) and the Man-jong basin (Reference ⑧). About halfway between Kumasan and Masan, a city pier (Reference ⑤), the main facility, has been constructed with railroad connections on the pier. A new wharf (Reference ③) was in process of construction in 1943. Reclamation work north and south of the city pier and also north of Kumasan was planned and in progress in 1934 and is believed substantially completed.

City Pier (Reference ⑤); details follow:

Location:	500 yds. N of Masan RR Station.		
Operated by:	City.		
Purpose:	General cargo and passengers.		
	Face	N side	S side
Length:	240'	700'	350'
Depth alongside:	14'	5' to 14'	7' to 14'
RR:	Spur on pier connects with main line.		

On either side of the customs pier (Reference ②) at Masan are a succession of small piers. The customs pier itself is a floating pier, 92 feet long and 31 feet wide, connected by gangway to the bulkhead. Depths alongside are 15 feet. The other piers range from 88 feet to 30 feet long and are privately owned and operated.

At Kumasan there are 2 boat basins (References ⑦ and ⑧) which are quayed. The Won-jong basin (Reference ⑦) is a rectangle 120 feet by 435 feet long and is protected by a stone breakwater with rubble base 207 feet long projecting eastward from the southeast corner of the basin. The basin has an area of 1.7 acres and depths alongside of 6 feet.

* References are encircled numbers on FIGURE VI - 70.

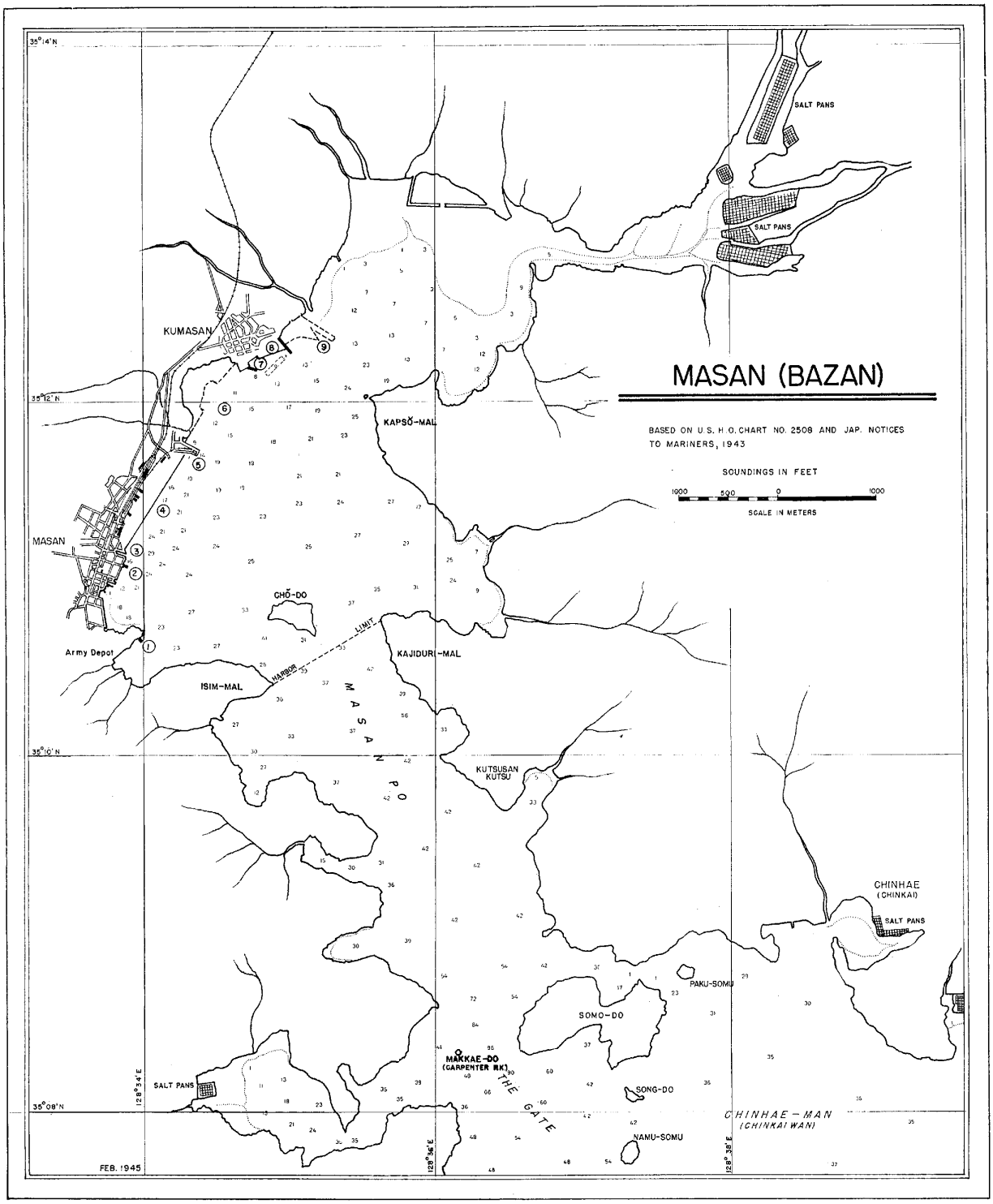

FIGURE VI - 70. *Masan.*
Port plan showing location of facilities by encircled reference numbers.

The Man-jong basin (Reference ⑧) is immediately north of the Won-jong basin and is formed by 2 small breakwaters projecting from either end of a quayed frontage 700 feet long. The southern breakwater projects eastward for a distance of 75 feet and the northern breakwater projects southeastward for a distance of 240 feet. It was planned to build a breakwater 775 feet long paralleling the shore in front of the Won-jong and Man-jong basins about 200 yards off-shore.

A mole (Reference ③) north of the customs pier (Reference ②) was reported under construction in the 1943 notices of the Japanese Hydrographic Office. It is indicated to be 600 feet long on its northern side, 330 feet long on its southern side, and 450 feet wide at its face. Depths alongside are supposedly being dredged to 24 feet.

On the south side of the promontory immediately below Masan is an army pier (Reference ①) connected by road to an army depot inshore. The pier is 150 feet long and 75 feet wide. Depths alongside are 8 feet.

The area between the city pier (Reference ⑤) and the Won-jong basin (Reference ⑦) was to be reclaimed beginning in 1929, to form a quayed frontage (Reference ⑥) about 1,000 yards long with depths alongside from 5 to 8 feet. In 1941, the work was reported still in progress. Also in 1941, plans were in process to construct a landing stage (Reference ④), south of the city pier (Reference ⑤), 3,911 feet long, equipped with a 15-ton crane. Reclamation work north of Man-jong basin (Reference ⑧) also was supposedly being carried on (Reference ⑨).

In 1933 Masan was reported to have 23 lighters ranging from 90 tons to 15 tons, total tonnage 720 tons. Also listed was 1 tug of 10 tons.

(3) *Storage facilities.*

Inshore from the customs pier (Reference ②) there are 2 customs warehouses. At Masan railroad station there is a customs warehouse and a warehouse belonging to the Chosen Railway Company. At Won-jong basin (Reference ⑦) in Kumasan there are 2 customs warehouses. Along the waterfront at Masan are 46 other privately owned warehouses. Some mechanical freight handling devices are reported.

(4) *Capacity and clearance.*

(*a*) *Actual annual traffic.* In 1936, 4,879 steam vessels totalling 372,314 tons and 2,079 sailing vessels totalling 55,579 tons entered the port.

(*b*) *Estimated unloading capacity.* Masan has an estimated unloading capacity of 7,500 long tons per day in the stream based upon an estimated 15 Liberty ships anchored in the channel south of Cho-do and serviced by lighters. Harbor improvements in process may render portions of the waterfront unusable, thus lowering the amount of cargo that can be handled from lighters.

(*c*) *Facilities for clearing port.* A single-track railroad line connects Masan with Pusan to the east and Chinjo to the west. There is a first class highway from Masan to Chinhae by way of Ch'angwon, where connections are also made by rail. The city pier (Reference ⑤) has a rail spur.

(5) *Repair facilities.*

There is a shipyard with 3 slips, each 165 feet long and 5 feet wide, capable of building 3,000 tons of merchant shipping per year. Another shipyard has 1 slip 180 feet long and 5 feet wide capable of building 500 tons of merchant shipping per year.

S. T'ongyong.

(34°51′N, 128°26′E)

T'ongyong (Tōei), one of the more significant of Korea's secondary ports, is on the southern coast about 40 miles southwest of Pusan (PLAN 19). The port is a base for a fishing fleet and handles trade for the hinterland. The natural harbor, which has 3 coves, is well protected from all except east winds, and can provide about 11 first-, 15 second-, and 7 third-class anchorage berths. About 12,800 feet of quayage with depths of 6 to 10 feet are available, principally along the shores of the coves on the north side of the harbor. About 17 buildings, which either are warehouses or can be converted, provide approximately 14,000 square yards of covered storage space, and open storage areas also are available. The estimated unloading capacity of the port is 5,000 long tons per day, discharged from 10 Liberty ships unloading in the stream.

(1) *Harbor.*

The natural harbor is formed by a southern projection of the mainland of Korea on the north and west, and by Miruk-to on the west and south (FIGURE VI-71). It is well protected from all except east winds. The north coast of the harbor has 3 coves: East Bay, Center Bay, and West Bay. These and other small boat anchorages provide protection for fishing craft.

About 11 first-, 15 second-, and 7 third-class anchorage-berths are available in the harbor. Usually large vessels anchor outside a line extending from Changji-do to Kongju-do (Kyō-shu-tō), where depths range from 26 feet and where the holding ground of mud, sand, and shell is good. Smaller vessels anchor within the line, where the maximum depth is 28 feet and the holding ground is mud and shells.

Spring tides rise 8½ feet, neaps rise about 6 feet, and the mean high water interval is 8 hours, 42 minutes. Information on tidal currents in the harbor is lacking.

The harbor is in a region of generally good weather. Storms are infrequent, and the harbor never freezes over. Storm signals were displayed to the west of Center Bay.

(2) *Landing facilities.*

Because hills rise sharply immediately behind a narrow beach, the coast, particularly on the north side of the harbor, has been bulkheaded and filled. On this reclaimed land, 12,800 feet of quayage with depths of 6 feet to 10 feet alongside is available for landing purposes. There are 2 mechanical coal loaders on 2 wooden-piling piers that extend from Quay No. 2 (Reference ②) (FIGURE VI-72).

Quay No. 1 (Reference ①)*; details follow:

Location:	Facing NW and SW sides of East Bay.
Length:	1,450′.
Depth alongside:	Probably dredged to 9′.
Berthage:	Small vessels only.
Width of apron:	35′.
Storage:	3 bldgs. covering a total of 1,900 sq. yds. are either warehouses or can be converted.

* References are encircled numbers on FIGURE VI-71.

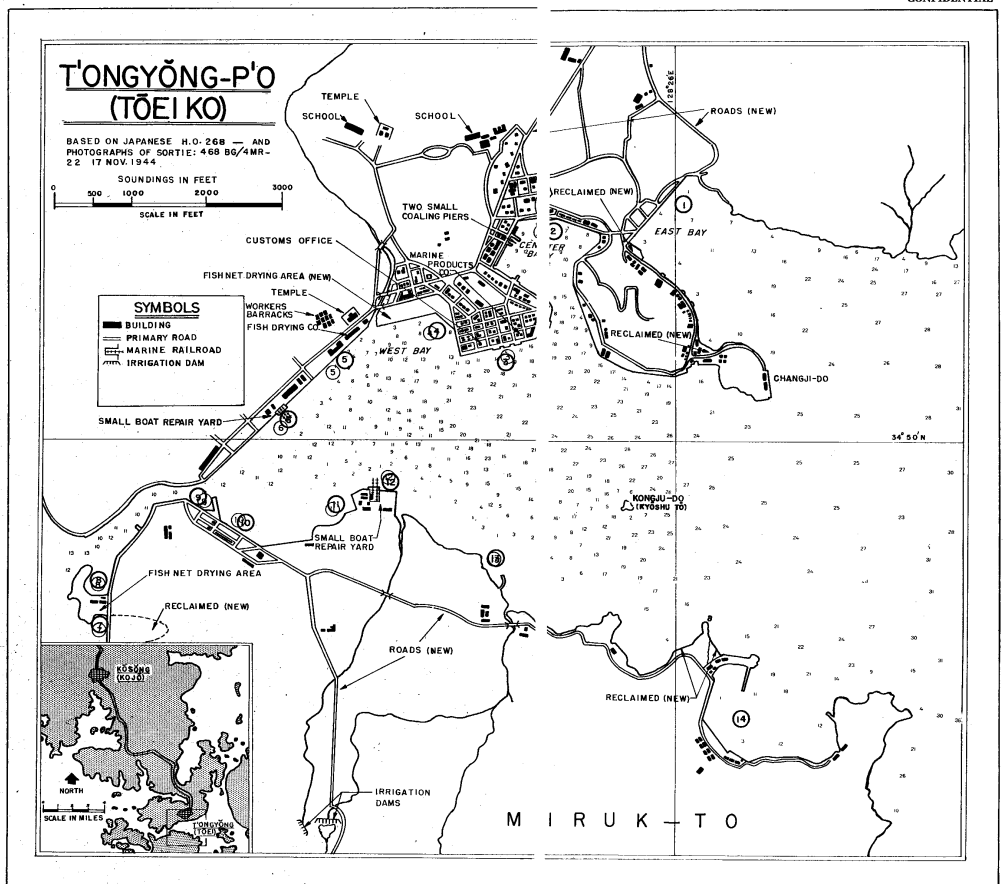

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FIGURE VI-71. *T'ongyŏng.*
Port plan showing location of facilities by encircled reference numbers.

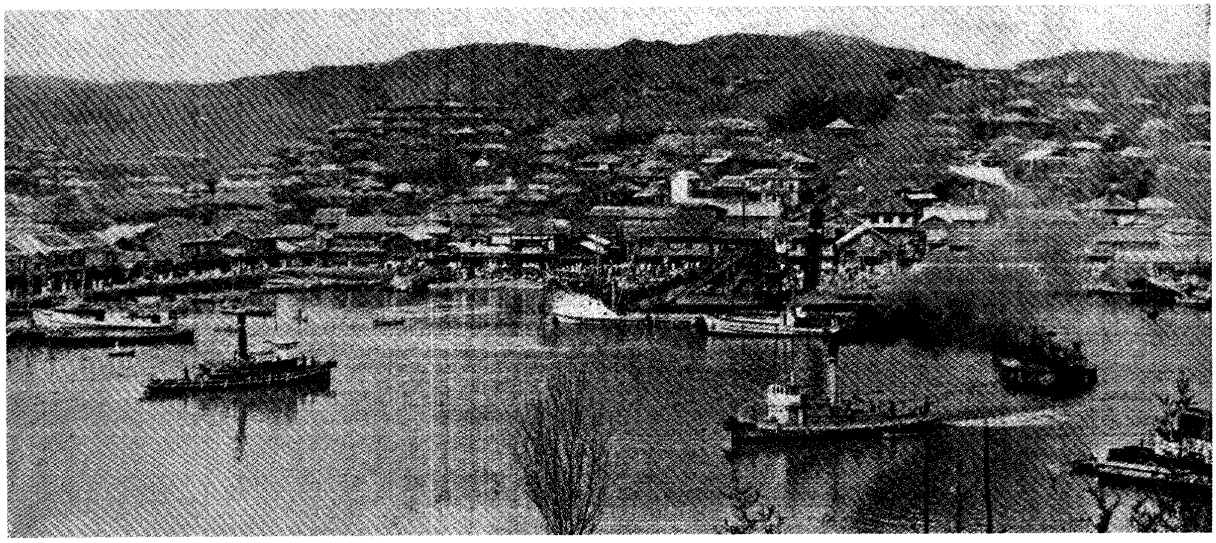

FIGURE VI - 72. *T'ongyong.*
Quay No. 2 (Reference ②) in Center Bay, looking westward, showing coaling pier and mechanical coal loader. Before 1930.

Roads:	End of quay joins road system of area.
Remarks:	Area of East Bay is 170,000 sq. yds.

Quay No. 2 (Reference ②); details follow:

Location:	Facing entire perimeter of Center Bay.
Purpose:	Unloading fishing fleet; servicing lighters; coaling
Length:	5,400′.
Depth alongside:	6′ to 9′.
Berthage:	Small vessels only.
Width of apron:	30′.
Storage:	5 bldgs. covering a total of 3,800 sq. yds. are either warehouses or can be converted.
Cranage:	2 mechanical coal loaders on 2 wooden-piling piers (160′ by 17′; 95′ by 12′).
Roads:	Joins road system of area.
Remarks:	Area of Center Bay is approx. 140,000 sq. yds.

Quay No. 3 (Reference ③); details follow:

Location:	Between Center Bay and West Bay.
Length:	1,750′.
Depth alongside:	10′ or above.
Berthage:	Small vessels only.
Width of apron:	45′.
Storage:	4 bldgs. covering an area of 1,600 sq. yds. are either warehouses or can be converted.
Roads:	Joins road system of area.

Quay No. 4 (Reference ④); details follow:

Location:	Facing E and N sides of West Bay.
Length:	1,600′.
Depth alongside:	Probably dredged to 9′.
Berthage:	Small vessels only.
Width of apron:	30′.
Storage:	1 bldg. covering an area of 1,500 sq. yds. is either a warehouse or can be converted.
Cranage:	Possibly 1 small wooden boom, probably used for lifting fish nets.
Roads:	Joins road system of area.

Quay No. 5 (Reference ⑤); details follow:

Location:	W of West Bay.
Length:	1,500′.
Depth alongside:	Probably dredged to 9′.
Berthage:	Small vessels only.
Width of apron:	30′.
Storage:	3 bldgs. covering an area of 4,000 sq. yds. are either warehouses or can be converted.
Roads:	Joins road system of area.

Quay No. 6 (References ⑩); details follow:

Location:	On Miruk-to.
Length:	1,100′.
Depth alongside:	Probably dredged to 9′.
Berthage:	Small vessels only.
Width of apron:	30′.
Storage:	1 bldg. covering an area of 1,200 sq. yds. either a warehouse or can be converted.
Roads:	Serviced by Miruk-to road system.
Remarks:	Probably used only for landing supplies for the island.

In addition, on the north coast of Miruk-to, there are 6 boat basins. Boat Basin No. 1 (Reference ⑦) has an area of about 3,000 square yards; No. 2 (Reference ⑧), about 9,000 square yards; No. 3 (Reference ⑨), 4,000 square yards; No. 4 (Reference ⑪), 16,000 square yards; No. 5 (Reference ⑬), 7,500 square yards; No. 6 (Reference ⑭), 200,000 square yards.

(3) *Storage facilities.*

The 17 warehouses (existing or convertible) listed under landing facilities, have a total area of 14,000 square yards. In addition, there are 5 areas totaling 54,000 square yards suitable for open storage. The storage area back of Quay No. 4 (Reference ④) seems to be used for drying fish nets.

(4) *Capacity and clearance.*

(*a*) *Actual annual traffic.* In 1936, 14,373 steam vessels with a total tonnage of 419,487 tons, and 4,852 sailing vessels with a total tonnage of 46,329 tons entered the harbor.

(*b*) *Estimated unloading capacity.* The unloading capacity of the port for general cargo by ships' gear has been estimated at 5,000 long tons per day, discharged from 10 Liberty ships unloading in the stream.

(*c*) *Clearance.* T'ongyong is not served by railroad, but it is the terminus of the east coast highway which is connected with all the landing facilities on the north shore.

(*5*) ***Supplies.***

Water can be supplied to ships at anchor by three 30-ton water boats with a maximum total capacity of 270 tons per day. However, the amount of water available in winter is inadequate. There is no open coal storage. The coaling piers are probably supplied from a nearby warehouse, and it is believed that a maximum of 300 tons of coal can be stored at one time. No oil tanks are located in T'ongyong, though packaged oil may be stored there. The town has electric power.

(*6*) ***Repair facilities.***

On the northwest side of the harbor there are 7 marine railways, each 160 feet long (Reference ⑥), and numerous repair buildings. On a small section of reclaimed land which projects northward from Miruk-to, there are two 150-foot marine railways (Reference ⑫), and 5 small repair buildings.

T. Samch'onp'o.

(34°55′N, 128°04′E)

Samch'onp'o (Sanzenho), a large fishing center and base for the southeastern Korean fishing fleet, is about 50 miles west of Pusan on the southern coast (PLAN 19). The hinterland consists of fertile lowlands producing grain, and dry areas used for cattle raising. Exports consisted of agricultural and fishing products such as cotton, wheat, rice, soy-beans, and fish; imports consisted mainly of manufactured products such as oil, sugar, drugs, and lumber.

About 4 third-class anchorage berths are available in fair protection and with good holding ground. About 1 first-, 1 second-, and 11 third-class berths are available in the roadstead, where tidal currents are strong and holding ground not good. The limited landing facilities are dry alongside at low water, and are used only by fishing craft.

(*1*) ***Harbor.***

The harbor of Samch'onp'o is on Samch'onp'o-sudo, a 1- to 2-mile-wide strait between Changsan-do (island) and the mainland (FIGURE VI - 73). The strait connects the large and almost landlocked bay of Kangjin-hae (Kōshin-kai) to the west with more open water to the east. The nearby coastline is very irregular and many rocks and islets lie off the mainland. Samch'onp'o harbor extends for about 2 miles along the northern (mainland) shore of the strait, and is bounded by Taebang (Daihō) to the west and by Changdung-mal (Chōtō-matsu) to the east. It consists of 3 small bays separated by rocky headlands.

The port facilities and the town are in the middle bay, which is protected by the rocky peninsula, No-mal (Ro-matsu), on the east, and by a small breakwater 360 feet long on the west. However, the middle bay is small and almost all of it dries at low water.

The eastern bay, called Samch'onp'o-myoji (Sanzenho-byōchi, Samch'onp'o Anchorage) is considerably larger than the middle bay and is used extensively as an anchorage for small vessels. In 1943, projected improvements included extensive filling and reclamation along the north and east shores of the bay and the construction of a breakwater on the southeast side. It is not known whether work has started.

(*a*) *Entrance channel.* Two channels, one from the east and one from the west, lead to the harbor of Samch'onp'o. The eastern channel is a series of passageways skirting the many scattered islets and rocks, and has a least depth of 40 feet.

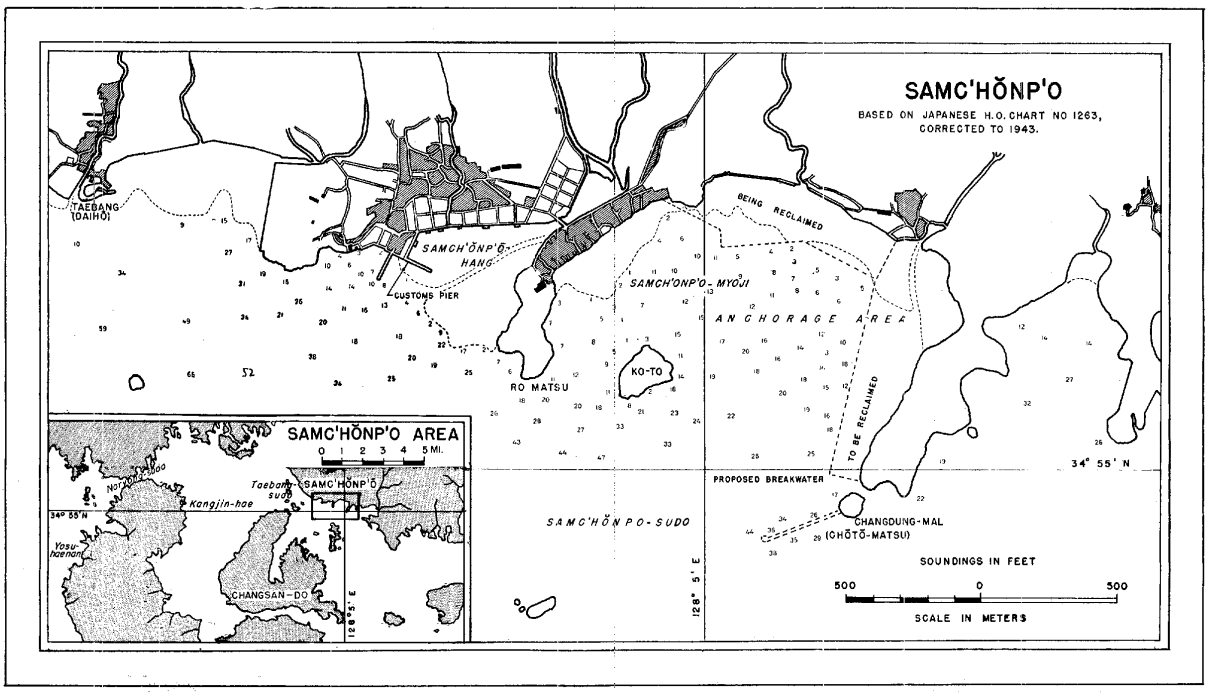

FIGURE VI - 73. *Samc'honp'o.*
Plan of harbor.

The western channel begins in Yosu-haeman; passes through Norjang-sudo (Roryō-suido) into Kangjin-hae; and then from Kangjin-hae passes through Taebang-sudo (Daihō-suidō) to Samch'onp'o-sudo and Samch'onp'o. Least depths in the fairway of the channel are 30 feet.

(*b*) *Anchorage.* Although water depths in the harbor vicinity are good, anchorage is limited by the hidden rocks and shoals. Foul ground and rocks lie off many of the islets south and southwest of the harbor. In the roadstead just off the port about 4 third-class anchorage berths can be obtained and others are available to the south of these. The holding ground is not good and tidal streams are strong.

The best anchorage area lies in the well-protected eastern bay, Samch'onp'o-myoji (Sanzenho-byōchi, Samch'onp'o Anchorage); here tidal streams are reported to be negligible and holding ground good, the bottom being sand and mud. In 1943 there were plans for a 960-foot breakwater extending westward from the tip of Changdung-mal (Chōtō-matsu). When completed, the breakwater will give good protection. Within Samch'onp'o-myoji (Samch'onp'o Anchorage) about 4 third-class anchorage berths are available; in the unprotected area south of the anchorage where tidal currents are strong, and holding ground not good, about 1 first-, 1 second-, and 7 third-class anchorage berths can be obtained.

(*c*) *Significant hydrographic features.* The mean high water interval at Samch'onp'o is 8 hours 54 minutes; springs rise 9.8 feet; neaps 7.2 feet. The flood tide generally flows west and ebb tide flows east. When the velocity of the stream is at its greatest, the flood current has a strength of 2 knots and the ebb 2.3 knots. At the narrows of Samch'onp'o-sudo, the flood current has a rate of 4.3 knots and the ebb current a rate of 4.5 knots. The flood and ebb currents reverse at about the time of the stand. The time of slack tide is short and the currents are weakest at about 30 minutes before and after high and low tides.

(*d*) *Local weather.* Exact meteorological data are not known but the climate is generally warm and damp, with considerable rainfall from May through September. There may be some snowfall in January, but the winters are usually mild. During the summer months some fog may set in. Winds are not strong and are not an obstacle to navigation. Southerly winds may impede small vessels anchoring in the harbor vicinity.

(*2*) ***Landing and storage facilities.***

The limited port facilities at Samch'onp'o are dry alongside at low water, and are used only by fishing craft. An angular quay-wall extends in 3 sections along the city front for 2,235 feet, and 1 pier extends southward about 400 feet with depths of 8 feet off the face at low water. At intervals along the quay-wall are six 60-foot landing stages.

Small warehouses and sheds are available near the customs house at the base of the 400-foot pier, but details of size are not known.

(*3*) ***Capacity and clearance.***

(*a*) *Actual annual traffic.* In 1940, 4,883 steamships with an aggregate tonnage of 498,150 tons and 3,930 small boats with a total tonnage of 128,792 tons entered the port of Samch'onp'o.

(*b*) *Facilities for clearing port.* Several steamship lines in 1941 were operating daily service eastward to T'ongyong, Masan, and Pusan, and westward to Yosu and Mokp'o.

One improved road leads northward to Chinju 25 miles inland which is the nearest railroad station. From Chinju a line runs through Masan to Samnanjin where it joins the Pusan-Mukden line. Several other roads lead to small towns in the vicinity.

(*4*) ***Supplies.***

A large well west of the city affords an abundant supply of water of good quality, and a small river east of Samch'onp'o is another source.

U. Yosu (Reisui).

(34°44′N, 127°45′E)

Yosu, an auxiliary and alternate port for Pusan, about 80 miles to the northeast, is on the southeast coast of Korea (PLAN 21). A small fishing village prior to 1930, development of Yosu has resulted from construction of a South Manchurian Railroad Co. single-track line to Kwangju. The original construction program was designed to cover 5 years and to give the port a 500,000-ton annual freight handling capacity. However, work was still in progress as late as 1940, and more recently the 1942 and 1943 Japanese Hydrographic Office notices to mariners have indicated continuing reclamation and construction.

In 1941, the port was reported as being used by the Japanese Army as a staging point in the transportation of troops and supplies from Japan proper to bases in northeastern Asia. Use of the port for naval purposes also has been reported. The port is the terminal of a 9- to 10-hour sea route connecting Korea with Hakata, on Kyūshū, in Japan proper.

Yosu has 2 harbors—South Harbor, site of the old port and now used primarily by fishing vessels, and North Harbor, more recently developed as the site of the railroad company pier and construction work on other major landing facilities. North Harbor can provide about 1 first-, 5 second-, and 5 third-class anchorage berths, and South Harbor can provide 6 third-class anchorage berths. Under favorable conditions of wind and sea, additional anchorage is available in the roadstead outside of the port.

The railroad pier can berth two 4,000-ton vessels and has an estimated unloading capacity of 800 long tons per day; reports also are available that this pier has been enlarged since 1940 to accommodate two 8,000- to 10,000-ton vessels. Quayage reported to be under construction in North Harbor is scheduled to berth at least an additional four 4,000-ton vessels. Completion of this quayage would increase the alongside unloading capacity of the port to 5,200 long tons per day. South Harbor has an estimated unloading capacity of 2,500 long tons per day, handled by lighters from ships at anchor.

(*1*) ***Harbor.***

A small peninsula, Paektanggum-mal, divides Yosu harbor into a north and a south harbor (FIGURE VI - 74). The South Harbor, the old port of Yosu, comprises that portion of Yosu-haehyop which is contained between the northern extremity of Tolsan-do and the southern side of the promontory ending in Paektanggum-mal, a water area of approximately 255 acres.

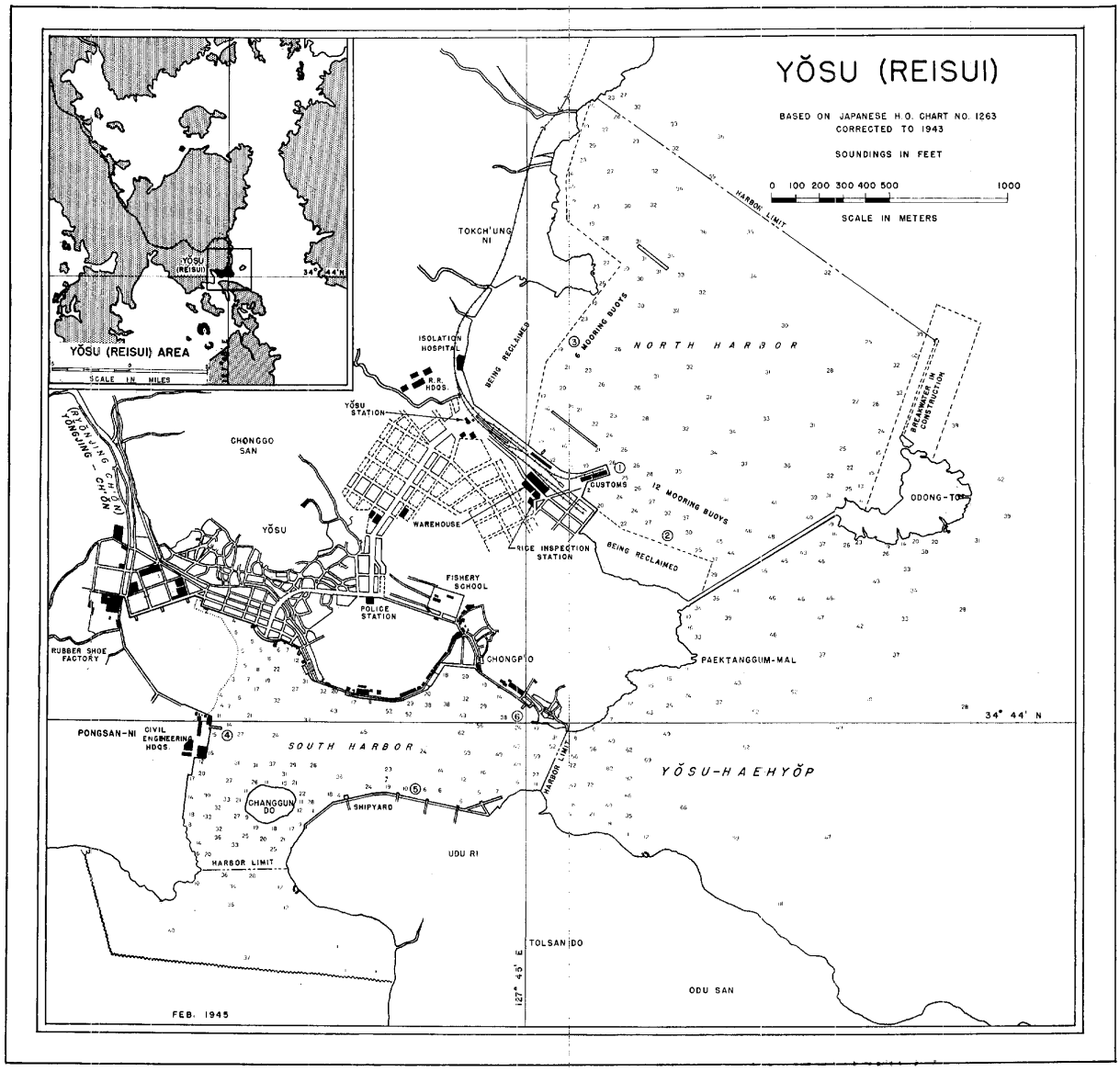

FIGURE VI - 74. *Yosu (Reisui)*.
Port plan showing location of facilities by encircled reference numbers.

The channel has an east and west direction in the eastern portion of the harbor and a north and south direction in the western portion of the harbor. The town of Yosu recedes from the curve of the channel along the northern bank of the estuary of the Yongjing-ch'on (Renchō-sen, Ryonjing Ch'on) which widens at its juncture with the Yosu-haehyop from 40 yards to 500 yards to form the innermost portion of the south harbor. Depths in the Yongjing-ch'on (Renchō-sen, Ryonjing Ch'on) estuary are under 5 feet, but increase rapidly in the Yosu-haehyop from 16 feet to 62 feet. The South Harbor is used mainly by fishing vessels.

The North Harbor is on the other side of Paektanggum-mal, less than a mile northeast of the old harbor, and is the newer port of Yosu developed by the South Korea Railroad Company. Originally an unprotected bay facing directly upon the Yosu-haeman, it is being transformed into a significant port by extensive harbor works. A breakwater 820 yards long connects the mainland at a point 240 yards north of Paektanggum-mal light to the island of Odong-to to the northeast, forming the southeastern boundary of the harbor. Another breakwater extending in a northeasterly direction from the northern extremity of Odong-to for a distance of 460 yards was still under construction in 1943. The harbor is open to the northeast along a front of 1,900 yards, but 2 breakwaters of 180 yards and 260 yards long, running northwest - southeast in the western portion of the harbor, provide protection for the anchorages in that area. North and south of the railroad company's pier a total area of 470,000 square meters was being reclaimed in 1943. Depths in the harbor are from 15 to 45 feet over an area of 500 acres.

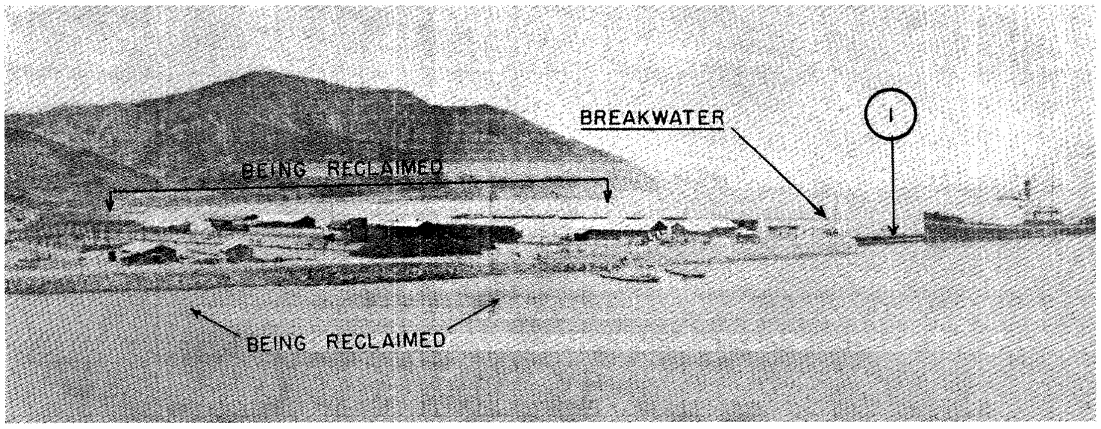

FIGURE VI - 75. *Yosu (Reisui).*
Railroad pier (Reference ①), looking northward into North Harbor from a point just southward of the pier, showing areas being reclaimed. Before 1936.

(*a*) *Entrance channel.* Yosu is on the western shore of the Yosu-haeman which opens southward directly into Chōsen-kaikyō. Depths are well over 35 feet, and the minimum width of the bay to Yosu is 3½ miles, widening to 25 miles where the bay meets the sea 20 miles south of Yosu. There are no navigational difficulties in the approach.

The North Harbor is entered from the northeast around Odong-to and the main breakwaters; the width of the harbor is 1,900 yards along this front on the Yosu-haeman. The South Harbor is entered from the east by way of Yosu-haehyop which flows into the bay south of Paektanggum-mal. The minimum width of the channel is 300 yards, and minimum depths in the fairway are over 35 feet. Small vessels can enter from the south by way of the waters west of Tolsan-do.

(*b*) *Anchorage.* The north anchorage, which covers a water area of approximately 400 acres with depths of from 15 to 45 feet, can provide about 1 first-, 5 second-, and 5 third-class anchorage berths. The best anchorage is just off the main breakwater between the mainland and Odong-to.

The south anchorage covers a water area of approximately 225 acres with depths of from 3 to 60 feet. The innermost portion of the harbor, covering about 30 acres, is less than 3 feet deep, and an additional 5 acres immediately adjacent to this area is from 3 to 15 feet deep, but the greater portion of the rest of the anchorage is over 15 feet deep, 1,600 yards long in an east and west direction, and 450 yards wide in a north and south direction. Changgun-do in the southwestern corner of the harbor practically cuts off the extreme southern end of the waterway. The best anchorage for small vessels is off Chongp'o in the eastern portion of the harbor. The South Harbor can provide about 6 third-class anchorage berths.

Prior to the construction of the breakwater to Odong-to, the best anchorage at Yosu was north of Yosu-haehyop and south of Odong-to over an area 1,200 yards long and 500 yards wide. Completion of the breakwater has cut off ready access to port facilities, but this area has 2 first-class anchorage berths. Under favorable conditions of wind and sea, additional anchorage is available in the roadstead outside of the port.

(*c*) *Significant hydrographic features.* At Yosu the mean high water interval is 8 hours and 41 minutes, springs rise 10.8 feet, neaps rise 7.9 feet, and the mean sea level is 5.9 feet above datum. In the north harbor the flood tide enters from the offing and the ebb tide reverses. In the south harbor the flood tide enters from the east and flows out the south entrance and the ebb tide reverses. Tidal rate was from 2 to 4 knots, but may have been increased by the reclamation and construction work which has been carried on in the area. Swells are apt to set into the South Harbor from the east and southeast, and occasionally swells set into the North Harbor from the northeast.

(*d*) *Local weather.* Winds are moderate and blow round the compass, northwest, north, and northeast from October through March, and southeast, south, and southwest from April through September. There is considerable rainfall from July through September. Some snow may fall in January and February. Fog is infrequent and light, usually clearing by mid-morning.

(2) *Landing facilities.*

Landing facilities in the South Harbor are limited to vessels of 200 tons and under. Quayed areas on Tolsan-do (Reference ⑤)* and at Pongsan-ni (Reference ④) could possibly be used by larger vessels but clearance ashore is difficult.

The South Korea Railroad Company Pier (Reference ①) in the North Harbor, the principal landing facility at Yosu, can berth two 4,000-ton vessels and has an estimated unloading capacity of 800 long tons per day (FIGURE VI - 75). Completed construction in the North Harbor contemplates also an extensive quay (Reference ②) south of railroad company pier and a longer landing stage (Reference ③) north of the pier. Other improvements are reported, including extension of the railroad company pier and the construction of several slips for small vessels.

Railroad Co. Pier (Reference ①); details follow:

Location:	North Harbor at RR terminal.		
Operated by:	South Korea RR Co.		
Purpose:	General cargo, military personnel and supplies.		
Construction:	Concrete.		
	Face	N side	S side
Length:	140′	394′	394′

* Encircled numbers are references on FIGURE VI - 74.

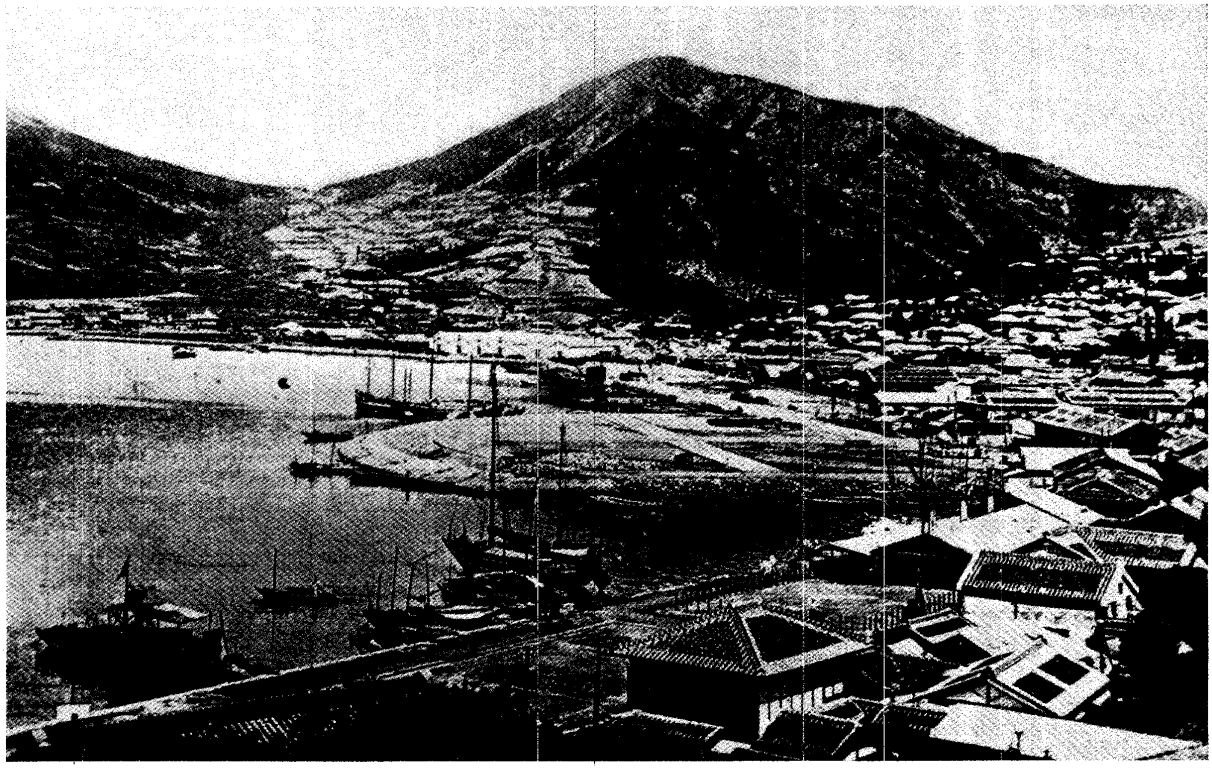

FIGURE VI - 76. *Yosu (Reisui)*.
Quayed north shore of South Harbor, looking west-northwestward.

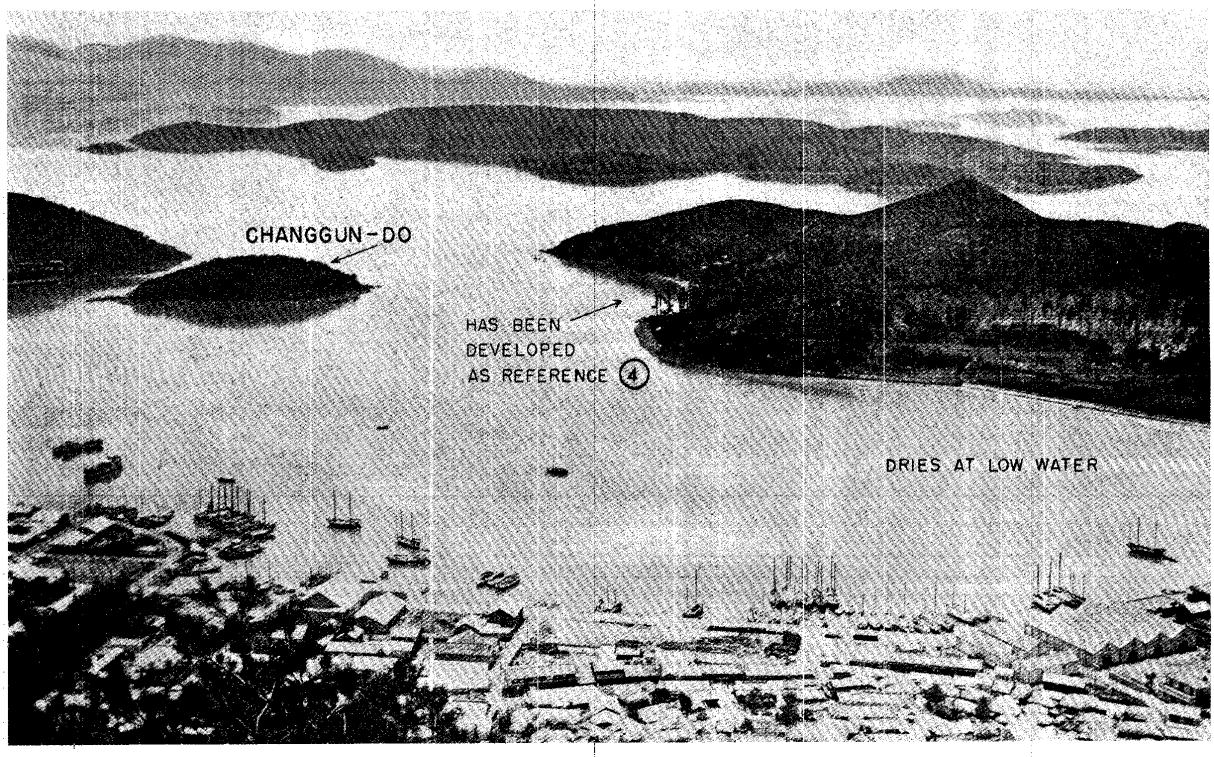

FIGURE VI - 77. *Yosu (Reisui)*.
South Harbor, looking southward at south entrance, showing quayed shoreline and probably warehouses. Around 1930.

FIGURE VI - 78. *Yosu (Reisui).*
South Harbor, looking northeastward across land into North Harbor, showing quayed waterfront and probable warehouses.

Depth alongside:	25′	19′ to 25′	19′ to 25′
Berthing space available:	—	One 4,000-ton vessel.	One 4,000-ton vessel.
Width of apron:	30′	80′	30′
Capacity (lbs. per sq. ft.):	Unlimited.		
Storage:	2 transit sheds on S side of pier. Additional warehouses inshore.		
RR and roads:	RR spur on N side of pier connects with marshalling yard and main branch line northward. A motor road paralleling the marshalling yard, connects the pier with Yosu.		
Estimated terminal capacity:	800 long tons per day.		
Remarks:	Reported to have been enlarged after 1940 to accommodate two 8,000- to 10,000-ton vessels.		

The Japanese Hydrographic Office 1940 and 1941 Sailing Directions give details of the proposed facilities north and south of the pier (Reference ①) and indicate that these facilities were scheduled for completion in 1941. However, the 1943 notices issued by the same office show reclamation work in this area still in progress. The construction plan provides for a quay (Reference ②) south of the pier, to be 1,740 feet long, with depths alongside from 20 to 35 feet, height above low water 16 feet, capable of berthing four 4,000-ton vessels. North of the pier a landing stage (Reference ③) 2,720 feet long is planned, with depths alongside from 13 to 20 feet. Marshalling yards, sheds, and roads are to be built on the reclaimed land. Completion of this work will greatly increase the terminal capacity of Yosu.

The South Harbor is designed mainly for fishing craft. The waterfront on the northern side of the harbor is quayed along its entire length, and there are numerous small piers at irregular intervals from the mouth of the Yongjing-ch'on (Renchō-sen, Ryonjing Ch'on) to the eastern harbor limit (FIGURES VI - 76, VI - 77, and VI - 78). Depths alongside vary from less than 3 feet to 16 feet along the western portion, and vessels frequently rest on the mud bottom or low water. Depths are deeper along the eastern portion.

East of Pongsan-ni on the west bank of the harbor is a mole (Reference ④), 600 feet long with an extending pier 150 feet long and 50 feet wide, and depths alongside 12 to 20 feet; this belongs to the Civil Engineering Department.

On the northern side of Tolsan-do there is a bulkheaded frontage (Reference ⑤) approximately 3,000 feet long with 3 small piers and depths alongside from 1 to 6 feet.

At Chongp'o in the northeastern corner of South Harbor there is a small protected boat basin (Reference ⑥), 150 feet wide and 300 feet long, which has been improved recently.

Three tugs of about 25 horsepower and 2 lighters of from 10 to 25 tons were reported in 1932.

(3) Storage facilities.

Besides the warehouse on the railroad company pier (Reference ①), there is a customs house and 3 additional warehouses within 200 yards of the pier. Improvement of the harbor contemplates additional shore facilities. An unspecified number of warehouses are reported along the northern bank of the South Harbor; at least 8 are in the northern corner.

(4) Capacity and clearance.

(a) Actual annual traffic. In 1936, 4,734 steam vessels totaling 760,607 tons and 15,756 sailing vessels totaling 101,696 tons entered the port.

(b) Estimated unloading capacity. Estimated unloading capacity for the North Harbor is 800 long tons per day on the assumption that the improvements contemplated are as yet unfinished. Completion of the quay and landing stage in North Harbor would increase the terminal capacity of the North Harbor to 5,200 long tons per day. Unloading capacity in the South Harbor is estimated at 2,500 long tons per day assuming offshore anchorage and service by lighters. Unfavorable weather would affect operations in the South Harbor more than in the North Harbor.

(c) Facilities for clearing port. Yosu is the southern terminal of the single-track line to Kwangju operated by the South Korea Railroad Company. There is a first-class road to Sunch'on. Tracks serve the railroad pier (Reference ①) and a marshalling yard is near some of the quayage under construction.

(5) Supplies.

It is not known whether supplies have kept pace with the development of the port. The city has a large water reservoir and there is a diesel oil plant for electric power west of the pier; power is also supplied by a hydroelectric plant at Posong (Hōjō).

(6) Repair facilities.

There are 3 shipyards building small wooden vessels at Yosu. One of these is in the South Harbor on the northwest side of Tolsan-do. Location of the others is not known.

V. Mokp'o.

(34°47′N, 126°23′E)

Mokp'o (Moppo, Mokuho) is a treaty port of southwestern Korea; it is at the tip of the Muan-pando (peninsula) behind a fringe of islands and shoals extending approximately 35 miles seaward (PLAN 22). A modern town, Mokp'o is the administrative center of the Cholla-namdo (province) and principal outlet for the cotton and rice grown in the region.

A plant manufacturing parts for small arms is reported, and there is a factory manufacturing cotton seed oil and cellulose. Destroyers and seaplanes of the Japanese Navy have used the harbor and recent reports indicate some naval and military development.

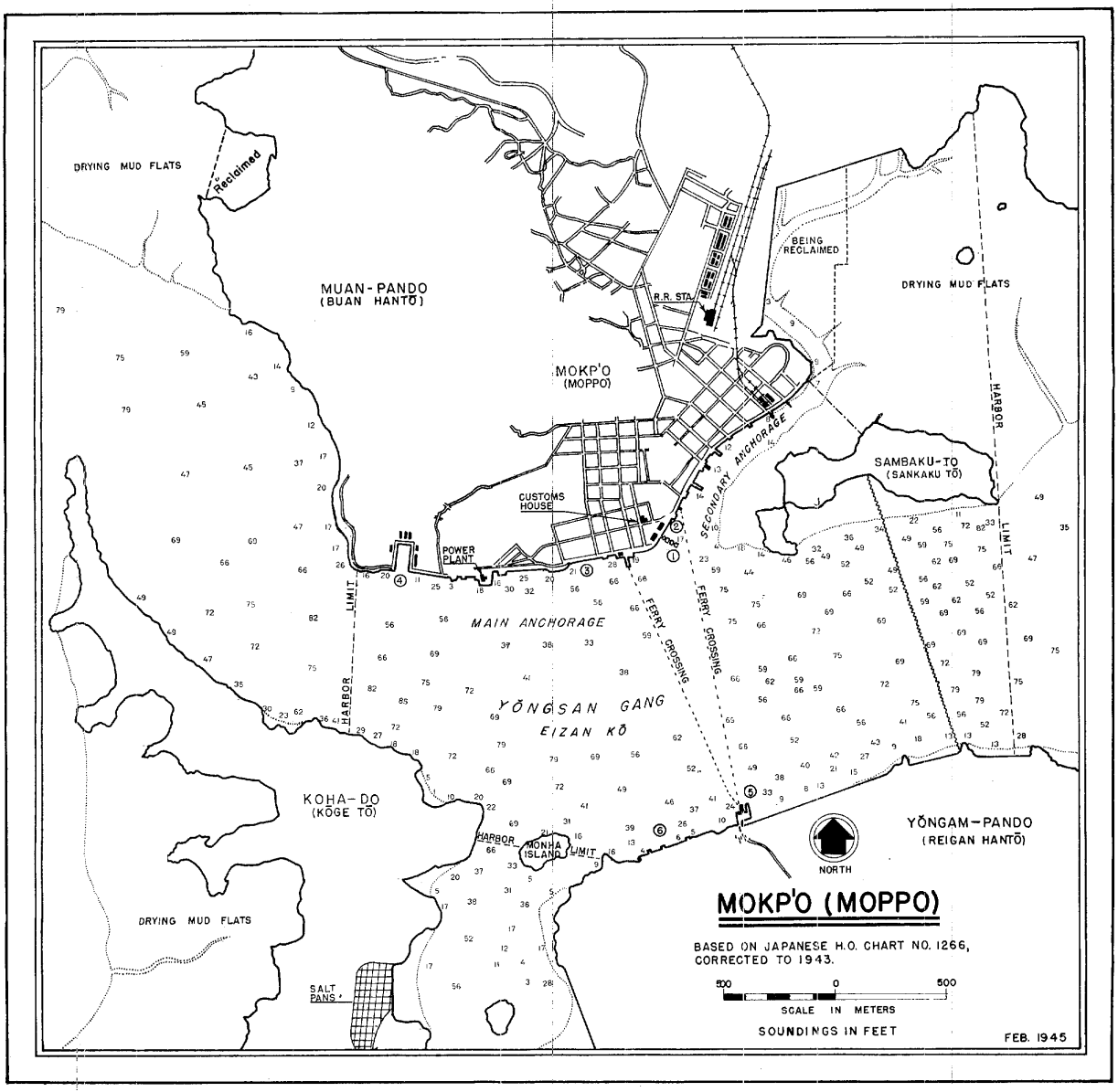

FIGURE VI - 79. *Mokp'o.*
Port plan showing location of facilities by encircled reference numbers.

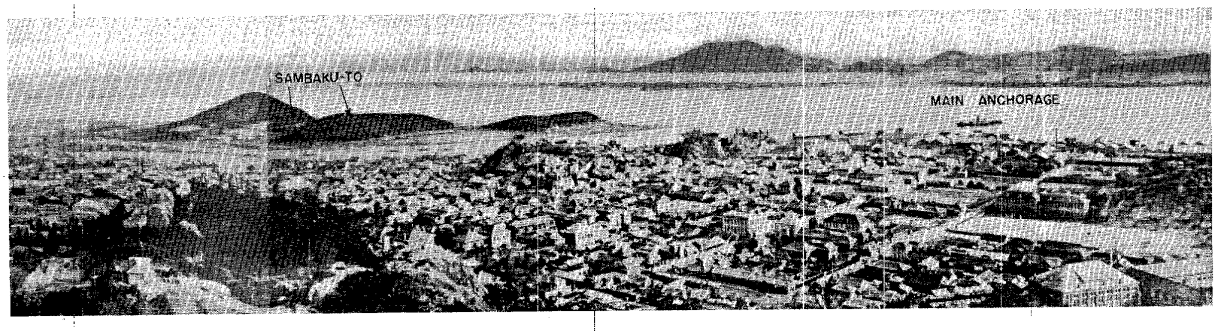

FIGURE VI - 80. *Mokp'o.*
Panorama of harbor, looking southwestward.

A 50-mile-long entrance channel leads between numerous banks and islands to the port. Least depth in the channel is 34 feet; least width is 630 yards. Vessels over 6,000 tons cannot readily enter the harbor.

About 15 second-class anchorage berths are available, and 4 more second-class berths in strong currents could perhaps be used. Two 2,000-ton vessels and many boats and lighters can berth alongside the landing facilities. Steam vessels usually anchor in the streams and work cargo into lighters.

The estimated unloading capacity is 3,300 long tons per day, of which 800 tons are worked from two 2,000-ton coasters alongside, and 2,500 tons from 5 Liberty ships off-shore.

A railroad and primary highway lead northward from Mokp'o. There was a regular and frequent steamship service to Dairen, Shanghai, and Japan.

(*1*) ***Harbor.***

Mokp'o-hang (harbor) is near the seaward end of the estuary of the Yongsan-gang (river). It is bounded on the north by the southwestern promontory of the Muan-pando (peninsula) and on the south by the northwestern extremity of Yongam-pando (peninsula) and the northeastern side of Koha-do (island). (FIGURES VI - 79 and VI - 80).

The harbor is entirely protected from wind and sea. The Main Anchorage has an area of 820 acres and depths of from 30 to 80 feet. The Secondary Anchorage, which is a narrow arm extending northeastward between Mokp'o and Samhak-to (Sankaku-tō, Sambaku Island), has an area of about 40 acres and depths of about 12 feet. The main activities of the port are conducted along the Mokp'o waterfront of the Secondary Anchorage. Mud flats which dry at low tide surround Samhak-to (Sambaku Island) and extend east and north for over 1 mile.

Vessels of up to 6,000 tons can enter the harbor but wharfage is available only for vessels of up to 2,000 tons. Small boats navigate as far as 30 miles farther up the Yongsan-gang (river).

(*a*) *Entrance channel.* A large number of banks and islands lie off the southwestern coast of Korea near Mokp'o; most of the channels between the islands are narrow and intricate. Two main channels lead to Mokp'o (U.S.H.O. charts 5454, and 5455). Vessels over 6,000 tons cannot readily enter.

The southern and deeper channel leads first through Changjuk-sudo (Chōchiku-suidō, Chegutsugu-pata) which lies west of the island of Chin-do (Chin-tō) then through Sia-hae (Jigakai, Julaa-pata), and finally around the southern and western coasts of Talli-do (Taarii-to) and along the northern side of Koha-do to Mokp'o harbor. This approach is about 50 miles long. Least depth is 35 feet and least width is 630 yards; both occur in the last 6 miles, between Talli-do (Taarii-to) and Mokp'o.

The northern channel has a least depth of 24 feet. It passes close south of the small island of So-rorok-to (Cheanoroku To) and then leads southeastward through Myondo-sudo (Miontosuido) to Talli-do (Taarii-to) from where it follows the same course as the northern channel.

The ebb curent in the channel around the southern coast of Talli-do runs at over 11 knots.

(*b*) *Anchorage.* Main Anchorage is 1½ miles long in an east and west direction and 800 to 1,300 yards wide in a north and south direction and has an area of 820 acres with depths of from 30 to 80 feet. The best anchorage in this area is within 300 yards off the south side of the town.

Secondary Anchorage extends from about the center of Main Anchorage northeastward between Mokp'o and Samhak-to (Sambaku Island) for about ½ mile and narrows from 300 yards to 100 yards wide. It has an area of 40 acres with depths of 12 feet. The bottom throughout is mud and sand. An attempt is made to keep the harbor dredged to a minimum depth of 12 feet.

There is a theoretical capacity of 11 first-class and 2 second-class anchorage berths, but since vessels over 6,000 tons cannot readily enter the harbor, a figure of 19 second-class anchorage berths more nearly approximates the maximum capacity of the port and this figure is reduced to about 15 second-class anchorage berths if areas unsuitable by reason of tide and current are excluded.

(*c*) *Significant hydrographic features.* At Mokp'o the mean high water interval is 2 hours 25 minutes, mean low water interval 8 hours 5 minutes, spring rise 11.8 feet, neap rise 9.5 feet, and mean sea level 6.9 feet above datum.

The ebb and flow of the tide continues for about one hour after stand and there is practically no time of slack water. The flood tide increases gradually to a maximum rate of 5 knots but the ebb tide increases rapidly to a maximum rate of 10 to 13 knots and the current an hour before low water is still 6 knots. The river currents of the Yongsan-gang (river) affect the tidal currents materially. In the center of Mokp'o anchorage, tidal and river currents combine to create whirlpools. East of Talli-do (island) in the Mokp'o channel the flood tide often flows southward, requiring special care when rounding the southeastern corner of Talli-do (island).

(*d*) *Local weather.* There is no ice in or near Mokp'o-hang (harbor). Snowfall is light, reaches a maximum in January, quickly disappears, and does not interfere with the working of cargo. There is considerable rainfall from the end of June through the beginning of September. Fog increases after April, reaches a maximum in June and July, decreases rapidly in August, and is heavier in the islands off Mokp'o, decreasing inland. The prevailing wind is from the north and wind velocities rarely exceed 30 miles per hour.

(*2*) ***Landing facilities.***

The Mokp'o waterfront, from the western harbor limit to the eastern extremity of the town, a distance of 1½ miles, is faced by a stone bulkhead which rises from the mud and sand bottom to street level. A hard-surfaced road follows along the entire waterfront immediately inshore from this embankment, the two together forming an extensive quay with an apron at least 20 feet wide. Small boats customarily load and unload directly from and onto this embankment, but since depths alongside are measured by the tide, steam vessels ordinarily anchor off-shore and carry on loading and unloading operations by means of lighters.

Several piers jut from the embankment. The main pier (Reference ①) * is a 340-foot pontoon pier which can accommodate two 2,000-ton vessels. The other pontoon-piers may have been added. The other known piers are from 30 to 100 feet long and serve as ferry landings, berths for lighters, and piers for munici-

* References are encircled numbers on FIGURE VI - 79.

pally operated craft such as police boats. A ramp pier (Reference ②) of heavy stone construction and about 30 feet wide slopes down to low water level. These piers break up the continuity of the eastern portion of the waterfront, but there is an unobstructed frontage (Reference ③), of about 720 feet adjacent to the western ferry landing.

Near the western harbor limit the embankment indents to form a rectangular basin (Reference ④).

On the Yongam-pando (peninsula) are a ferry slip (Reference ⑤) and quayed waterfront (Reference ⑥).

About 60 lighters, ranging from 25 to 60 tons, serve the port. Tug boats include one 17-ton steamer and 4 motorboats of from 3 to 6 tons.

(*a*) *General-cargo terminals.* The 341-foot pontoon-pier (Reference ①) is the only available pier for berthing steam vessels. In addition, the stone ramp-pier (Reference ②), boat basin (Reference ④), and portions of the embankment (Reference ③) could serve as unloading areas for small craft and lighters when conditions of the tide are favorable.

Pontoon pier (Reference ①); details follow:

Location:	At southwestern end of Secondary Anchorage.
Operated by:	Customs house.
Purpose:	General cargo handling.
Construction:	3 moored pontoons with wooden decks connected to bulkhead by gangway.
Length:	Face 70′; side 340′ (approx.).
Depth alongside:	18′ at face.
Berthage:	Two 2,000-ton vessels.

Customs house pier (Reference ②); details follow:

Location:	In front of customs house site.
Operated by:	Customs house.
Purpose:	General cargo handling.
Construction:	Heavy stone ramp-pier.
Length:	Ramp face 30′; side uncertain.
Depth alongside:	3′ at low tide.

Mokp'o quay (Reference ③); details follow:

Location:	Fronting on main anchorage.
Purpose:	General cargo handling by small craft.
Construction:	Stone embrankment.
Length:	720′ (approx.).
Width of apron:	20′ (approx.).

Boat basin (Reference ④); details follow:

Location:	220 yards east of western harbor limit.
Purpose:	Unloading edible seaweed and securing small vessels.
Construction:	Concrete and stone.
Dimensions:	350′ by 180′.
Depth alongside:	3′ at low tide.

(*b*) *Miscellaneous docking facilities.* The ferry slip (Reference ⑤) and Yongam Quay (Reference ⑥), both on the southern side of the harbor, provide limited facilities for cargo handling. The slip is approximately 130 feet long and 20 feet wide, with depths of about 10 feet. The quay is about 1,200 feet long with depths alongside of from 3 to 6 feet.

(3) *Storage facilities.*

There are several warehouses along the Mokp'o waterfront for the storage of various products, chiefly cotton and rice. These warehouses are reported to be wooden structures, approximately 40 feet by 60 feet, two stories high, with corrugated iron roofs. The exact number and location of all warehouses are not known, but there are at least 2 such strucutres on the customs site inshore from Reference ②, 2 or 3 at the waterfront terminus of the railroad, and an additional 5 to 7 between these two points. Freight is moved by hand-truck and man-power.

(4) *Capacity and clearance.*

(*a*) *Actual annual traffic.* Detailed figures for recent years are not available. In 1934, steam vessels with a total tonnage of 899,382 tons entered the harbor, and in 1937 an aggregate of 592,000 tons of freight was handled.

(*b*) *Estimated unloading capacity.* The estimated unloading capacity for Mokp'o-hang (harbor) is 3,300 long tons per day, 800 tons worked from 2 coasters alongside, and 2,500 tons from 5 Liberty ships off-shore. Due to the tidal range, shore facilities are not readily available at low water. Vessels over 6,000 tons do not enter the harbor because of the navigational hazards in the approaches.

(*c*) *Facilities for clearing port.* Mokp'o is the southern terminus of the single-track railroad line to Taejon via I-ri. In 1940 seven trains per day ran to and from Mokp'o. There is a primary highway between Mokp'o and Kyongsong. Small boats operate as far as 30 miles inland up the Yongsan-gang (river).

(5) *Supplies.*

Supplies were abundant for peace-time commercial traffic.

(*a*) *Water.* Mokp'o's main water supply is drawn from a stream impounded about 25 miles north of the city. The pipe line follows the railroad. Another reservoir is about 5 miles north of the city, and two small reservoirs close-by have a 3-day supply capacity. Purification is effected at a plant about one mile north of the main highway. A municipal water supply pier on the waterfront is equipped with 64-millimeter hydrants capable of supplying 100 metric tons in 10 hours. There are 3 individually owned water supply ships equipped with pumps.

(*b*) *Oil and gasoline.* Standard Vacuum Oil Co. had offices and gasoline storage tanks at the eastern extremity of the town and there are three large storage tanks for petroleum inshore from Reference ⑥ on the Yongam Peninsula. There are 2 privately owned tank ships with a capacity of 19 tons and 7 tons respectively. Both have hand operated pumps and 50-millimeter oil pipes. They are capable of supplying 20 tons in 10 hours.

(*c*) *Coal.* There is a bunkering capacity for coal of 7,900 metric tons and coal lighters can supply 500 metric tons a day. However, coal is reported to have become scarce.

(*d*) *Electricity.* There is a coal-burning electric generating plant (2,250 kilowatt) on the waterfront between References ③ and ④. It supplies power for an area extending 40 miles inland.

(6) *Repair facilities.*

There are no drydocks, marine railways, or major shipbuilding facilities at Mokp'o. There is one private builder of wooden ships up to 100 tons and two private builders of ships up to 20 tons. Five small-scale iron works can service small craft.

W. Yongdangp'o.

(38°00'N, 125°42'E)

Yongdangp'o (Ryūtōho) is on the western coast of Korea, on the northern bank at the head of Haeju-man (PLANS 29 and 31). It is about 95 miles northwest by rail from Kyongsong, 53 miles in a direct line southeast of Chinnamp'o, and is the port for Haeju, a town about 3 miles to the north.

Yongdangp'o serves a large rice-growing area, but it is probably more an industrial than an agricultural center. It has a large explosives factory with underground storage reported in surrounding hills; a cement plant, and an iron plant which are very close together; and a branch factory of the West Chōsen Heavy Industry Co., which manufactures mining machinery, cement-making machinery, high precision tools and small ships. Yongdangp'o is also a loading port for the low grade iron ores of western Hwanghae-do.

The entrance channel leads between drying banks for about 25 miles, and is about 21 feet deep. Several third-class anchorage berths are available. About 525 feet of quayage have depths alongside varying from 17 to 19 feet, and about 459 feet of quayage are accessible only at high tide. Vessels drawing more than 17 feet must anchor about 1½ to 2 miles off the town and work cargo by lighter.

(1) *Harbor.*

The well sheltered port is northwest of the bend of Haeju-man, and about 25 miles from the entrance. The harbor covers a water area of approximately 920 acres. It has 2 parts. The inner part, a large bay most of which dries at low water, is separated from the outer part by a strait about 800 yards wide (FIGURE VI - 81). The outer part has variable depths averaging about 20 feet near the strait, but decreasing outwards.

The town and the main facilities are on the northern side of the strait.

Vessels of more than a 17-foot draft must anchor about 1½ to 2 miles southeast of the town and handle cargo by lighter.

Reclamation is under way east of Yongdangp'o, and the area to the southeast and east is being dredged to a depth of 20 to 25 feet.

(*a*) *Entrance channel.* Banks, islets, and rocks extend across the entrance to Haeju-man, and there are numerous banks inside Haeju-man both in the center and extending for 1 to 6 miles from the shores.

The entrance to Haeju-man is about 25 miles south of Yongdangp'o. Two main channels lead through rocks and islets at the entrance and through banks within the bay to the port (U.S.H.O. chart 3237 and PLAN 29).

The western channel enters between Yuk-to (Roku-to) and the rocks to the southeastward, where it has a navigable width of about ½ mile. It then passes west of the central banks, where it is 200 yards wide and about 19 feet deep.

The eastern channel enters between Sok-to and Kal-to and then passes east of the central banks. It is about 21 feet deep and is slightly wider than the western channel.

Toward the head of the bay the 2 channels unite.

(*b*) *Anchorages.* Japanese sources report no good anchorages near Yongdangp'o; and since the tidal streams are reported to attain a maximum rate of from 5 to 6 knots, and the winds are variable, vessels must take great caution in mooring southwestward of Chong-do up to the harbor, especially at night.

Fair anchorage providing several third-class berths is obtainable about 1,000 yards south of Chong-do. Ships generally anchor with plenty of cable out, in depths of from 3¾ to 5 fathoms; however, the rocky bottom makes poor holding ground, and ships are forced by limitation of space to anchor in mid-channel, where the tidal streams are strongest.

In the center of the 1-mile channel leading from Chong-do to Yongdangp'o, several vessels of 1,000 tons can anchor at one time. The bottom is sand and rock.

(*c*) *Significant hydrographic features.* The mean high water interval in Yongdangp'o is 5 hours, 14 minutes; springs rise 24 feet, and neaps 18 feet. The mean level above datum is 13 feet.

The flood current flows from both entrances of Haeju-man toward Yongdangp'o. Its mean maximum rate is 2½ knots up to the harbor; however, in the strait at the entrance to the inner bay, between Yongdangp'o and Chinp'o-gak, it attains a rate of 4½ knots. The ebb current flows eastward, and has a mean maximum rate of 2¾ knots up to the harbor; however, between Yongdangp'o and Chinp'o-gak, it attains a rate of 4¾ knots.

(2) *Landing facilities.*

About 525 feet of quayage have depths alongside ranging from 17 to 19 feet, and about 459 feet of quayage are accessible only at high tide.

An area extending 273 yards east of Yongdangp'o quay (Reference ①)* has been dredged to a water depth of 25 to 27 feet, and a quay wall constructed along the bank.

Yongdangp'o quay (Reference ①).

Location:	S side of Yongdangp'o in front of customs and harbor offices.		
Construction:	Believed to be masonry, or concrete caisson bulkhead with earth fill.		
	Face	E side	W side
Length: (approx.)	525′	33′	82′
Depth alongside:	17′ to 19′	25½′	10½′
Storage:	8,646 sq. ft. (approx.) floor space of warehouses on quay. 7,220 sq. ft. (approx.) floor space of warehouses at end of spur which runs northwestward from the quay.		
Cranage:	One 1½-ton traveling crane. One 15-ton floating crane.		
RR and roads:	Railway and road connections with Haeju. 1 spur leads to warehouses northwestward from quay.		

Chōsen Cement Co. quay (Reference ②).

Location:	Directly in front of Chōsen Cement Co. plant, Chong-do.		
Operated by:	Chōsen Cement Co.		
Construction:	Reported to be concrete. One 213′ by 66′ (approx.) landing stage and one 49′ (approx.) jetty project from quay.		
	Face	E side	W side
Length:	459′	33′	33′
Depth alongside:	0′	0′	0′
Storage facilities:	Believed to be 2 fair-sized transit sheds on shore where the landing stages project from the quay.		
RR and roads:	Railway and road connections with Haeju. Highway runs between the Yongdangp'o quay and cement plant quay.		

* References are encircled numbers on FIGURE VI - 81.

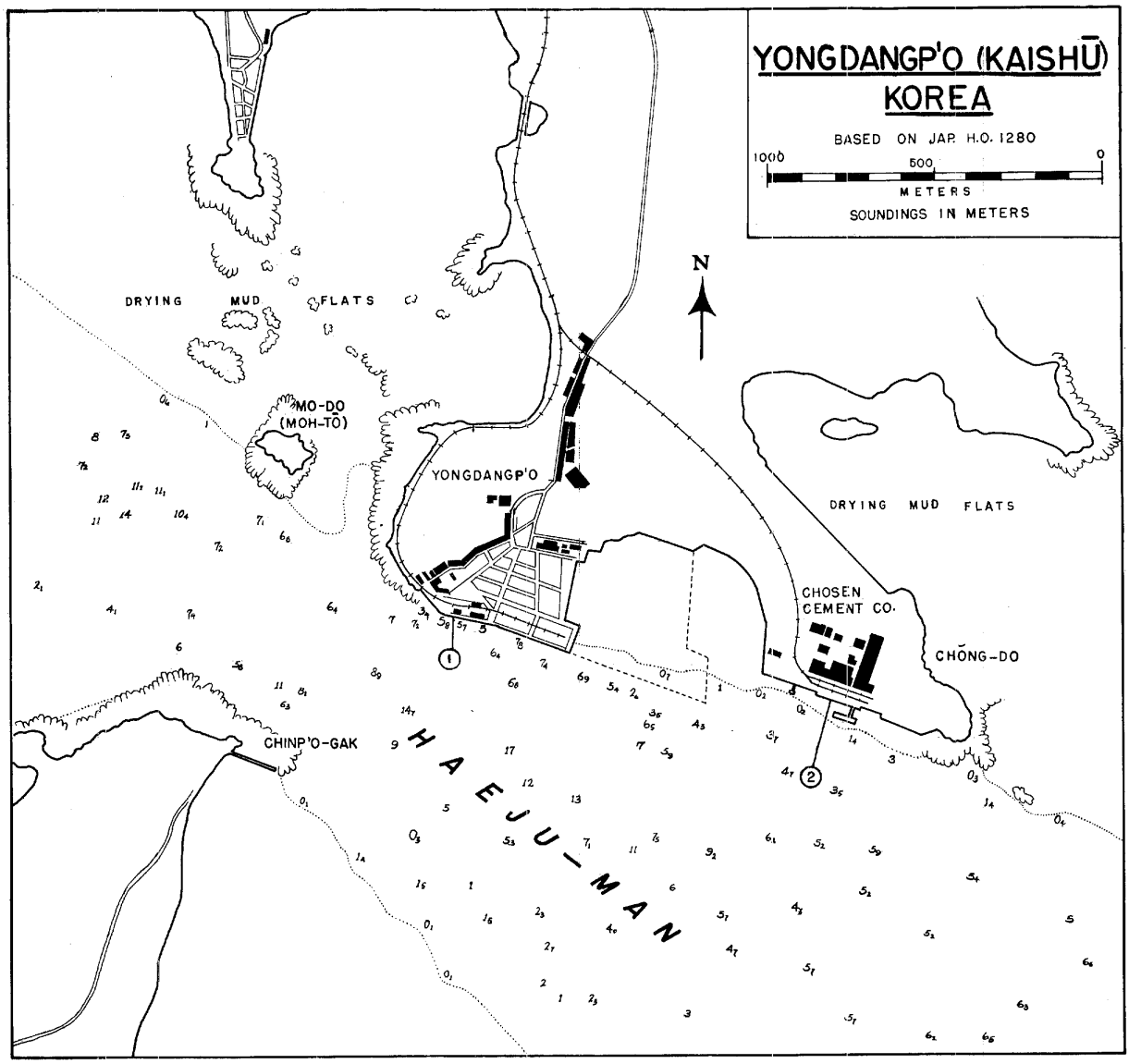

FIGURE VI - 81. *Yongdangp'o.*
Port plan showing location of facilities by encircled reference numbers.

(3) ***Storage facilities.***

Warehouses on the Yongdangp'o quay (Reference ①) occupy approximately 8,646 square feet of floor space and others at the end of the spur which runs northwestward from the quay (Reference ①) occupy about 7,220 square feet of floor space. Two fair-sized transit sheds are believed to be on the Chōsen Cement Co. quay (Reference ②).

(4) ***Capacity and clearance.***

(*a*) *Actual annual traffic.* Steamships of the Chōsen-Yūsen K.K., and Jinsen-Yūsen K.K. touch at the port of Yongdangp'o. In 1935, 505 steamships totaling 167,890 tons, and 335 sailing vessels totaling 5,607 tons entered the port.

(*b*) *Facilities for clearing port.* All railway lines serving Yongdangp'o and Haeju are narrow-gauge, single-track lines, operated by the Korean Railway Company. The line from Yongdangp'o, passes through Higashi-Kaishū (East Haeju), and connects with the Pusan - Mukden main line at T'osong-ni.

Between Haeju and Yongdangp'o, is a two-lane, macadam highway (improved, over 12 feet) from which a road (details unknown) branches off and leads to the Chōsen Cement Co. From Haeju 2 improved highways connect with the Kyongsong to P'yongyang primary highway at Kaesong and at Sariwen. Improved highways also conect Haeju with Chinnamp'o and Ongjin.

(5) ***Supplies.***

The city of Haeju has a water works, and the quality of the water is reported to be good. The water supply is reported to be obtained from a reservoir-and-filtering plant situated in the

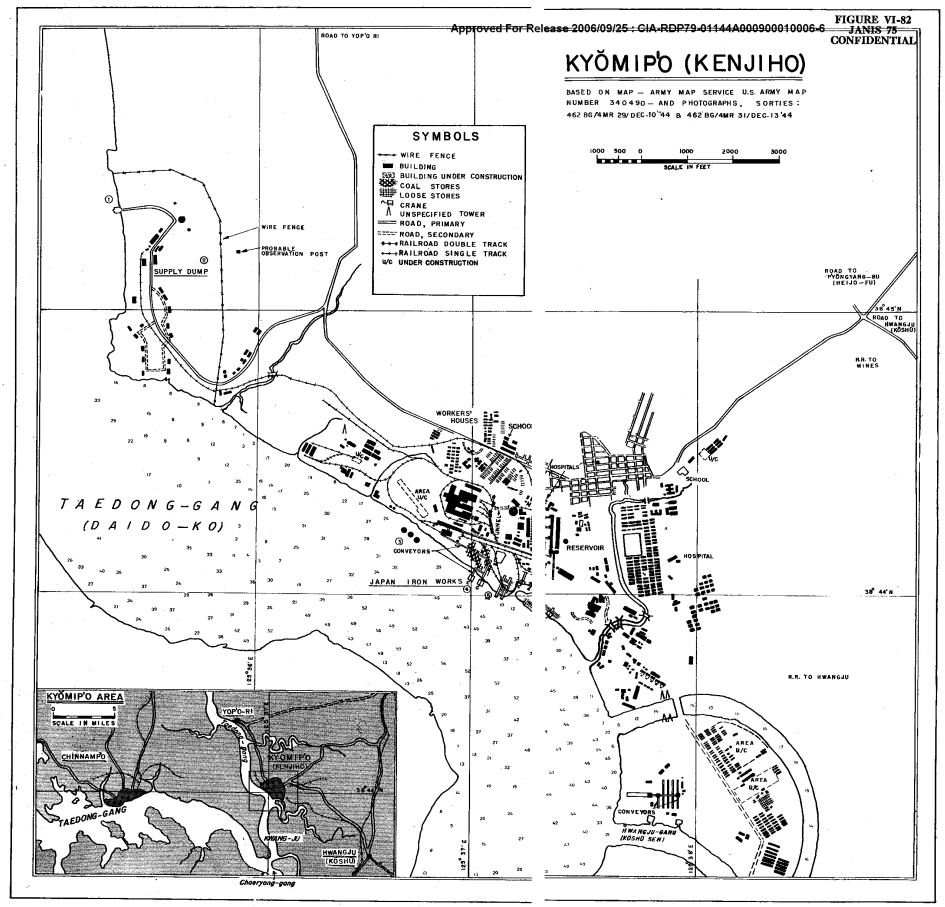

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FIGURE VI-82. *Kyomip'o.*
Port plan showing location of facilities by encircled reference numbers.

mountains about 1 mile due east of town. It is not known whether Yongdangp'o is connected to this supply.

A 40,000-kilowatt power plant is connected with the cement plant.

X. Kyomip'o.

(38°45'N, 125°38'E)

Kyomip'o (Kenjiho), is in northwestern Korea on the Taedong-gang (river) 16 miles above Chinnamp'o, and about 46 miles from the open sea (PLAN 31). It is the site of the Mitsubishi-owned Japan Iron Works, the largest iron and steel works in Korea. There are no landing facilities for deep-draft vessels; the few facilities available are used by lighters working cargo for the iron, steel, and coking plants.

The works had an estimated 1944 capacity of about 300,000 tons of pig-iron, and of about 150,000 tons each of steel ingots and rolled steel.

The river at Kyomip'o is frozen from about the beginning of January to the middle of March.

About 4 first-, 3 second-, and 3 third-class anchorage berths are available over generally poor holding ground. The estimated unloading capacity is 2,000 long tons per day from 4 Libertys, at anchor.

(1) *Harbor.*

(FIGURE VI - 82).

(*a*) *Entrance channel.* Least depths in the Taedong-gang (river) up to Kyomip'o are between 5 and 6 fathoms, but 5,000-ton vessels have been reported as the largest vessels to enter Kyomip'o harbor.

The entrance channel as far as Chinnamp'o is described under the principal port of Chinnamp'o (Topic 61, J). From Chinnamp'o to the bend where it is joined by the Chaeryong-gang (Sainei-kō) (river), the Taedong-gang (river) is over 400 yards wide between the 5-fathom contours and is free from dangers; a mid-channel course should be maintained.

Beyond the bend, caution is necessary with constant soundings and bearings taken. From the turn of the bend to the Kwang-ju (Hiro-shū, Hiro Su) (shoal) the current runs very strong. At Kwang-ju, the width between 5-fathom contours is about 200 yards and the navigable width for shallower draft vessels is only a little more. Vessels have been reported to scrape bottom at the shoaler part of Kwang-ju in depths of 16 feet. After passing this shoal, a mid-channel course should again be steered.

(*b*) *Anchorage.* About 4 first-, 3 second-, and 3 third-class anchorage berths are available in the river roadstead. The roadstead ordinarily accommodates ten to fifteen 3,000-ton vessels.

The holding ground in the roadstead off the town is in general poor with a rocky bottom, but there are some patches with a layer of mud and sand over the rock. Heavy swells may set in the roadstead during strong winds.

(*c*) *Significant hydrographic features.* The mean high water interval is 11 hours, 10 minutes. The high water springs rise to 21 feet; neaps to 17 feet; and mean tide level is 12 feet.

In the middle of the river off Kyomip'o the flood stream turns southeastward about 1 hour and 10 minutes after high water; the ebb stream turns northwestward about 1½ hours after low water after running for about 6½ hours. The maximum rate of the flood tidal stream is 3½ knots; and that of the ebb tide, 4¼ knots. Although there is no period of absolute slack water, the stream is very weak for about a half hour during the turns. The tidal streams close to the banks of the river usually turn about an hour earlier than in mid-stream.

In the narrow channel westward of Kwang-ju (Hiro-shū), 1½ miles south of Kyomip'o, the flood stream turns to the south-going stream 5 minutes after high water at Kyomip'o, after running for 5 to 5½ hours. The ebb tide turns to the north-going stream about 40 minutes after low water at Kyomip'o, after running for about 7 hours. The flood here attains a rate of 5 knots and the ebb 7 knots.

(*d*) *Local weather.* The Taedong-gang (river) above the bend where it joins the Chaeryong-gang, is frozen from about the beginning of January to the middle of March. The entrance to the estuary may be completely blocked with drift ice from about the middle of January to the middle of February.

In winter strong north and northeast winds prevail; in the spring westerlies prevail. Strong gales and storms blow in March and April.

(2) *Landing facilities.*

The landing facilities at Kyomip'o are primarily used to handle specialized bulk materials for the Japan Iron Works. Cargo is worked entirely in the stream with no alongside berths available for large vessels. The principal shore facilities for lighters and small craft are at the coal and ore plants in the basin and adjoining areas, south of the Japan Iron Works (FIGURES VI - 83 and VI - 84).

In 1937, 50 lighters of 50 to 100 tons each, and 4 tugboats of 120 to 180 horsepower, were available.

A floating crane (27 feet by 70 feet) is in the harbor.

The 5 landing places for lighters on the waterfront are listed below:

Lighter basin (Reference ⑥)*; details follow:

Purpose:	Discharging of ore to adjacent open storage pile.
Construction:	Concrete bulkheads; stone steps on E and W sides.
Length:	N side—420'. E and W sides—180' each.
Depth alongside:	Dries at low water.
Storage:	Ore storage—420' by 210'.
Cranage:	2 cantilever traveling bridge cranes for discharging ore from barges; capacity, 2 to 5 tons. 1 overhead conveyor to ore bins.
RR and roads:	RR and road connections with blast furnaces.
Remarks:	Major lighter facility at Kyomip'o; area of basin approximately 75,600 sq. ft.

Coal plant (Reference ④); details follow:

Purpose:	Discharge of coal.
Construction:	2 coal unloaders supported by offshore girders; no elaborate support platform.
Dimensions:	2 coal unloaders extend 125' offshore.
Depth alongside:	Approximately 12'.
Storage:	Coal storage to rear—550' by 440'.
Cranage:	2 coal unloaders with feeder-conveyor system.
RR and roads:	2 RR spurs and road connection with coking ovens.
Remarks:	Worked by lighters; shore quayed for 1,400'.

West plate and shape storage quays (Reference ⑤); details follow:

Purpose:	Lightering of steel products for export.
Construction:	Probable concrete-faced marginal wharf.

* References are encircled numbers on FIGURE VI - 82.

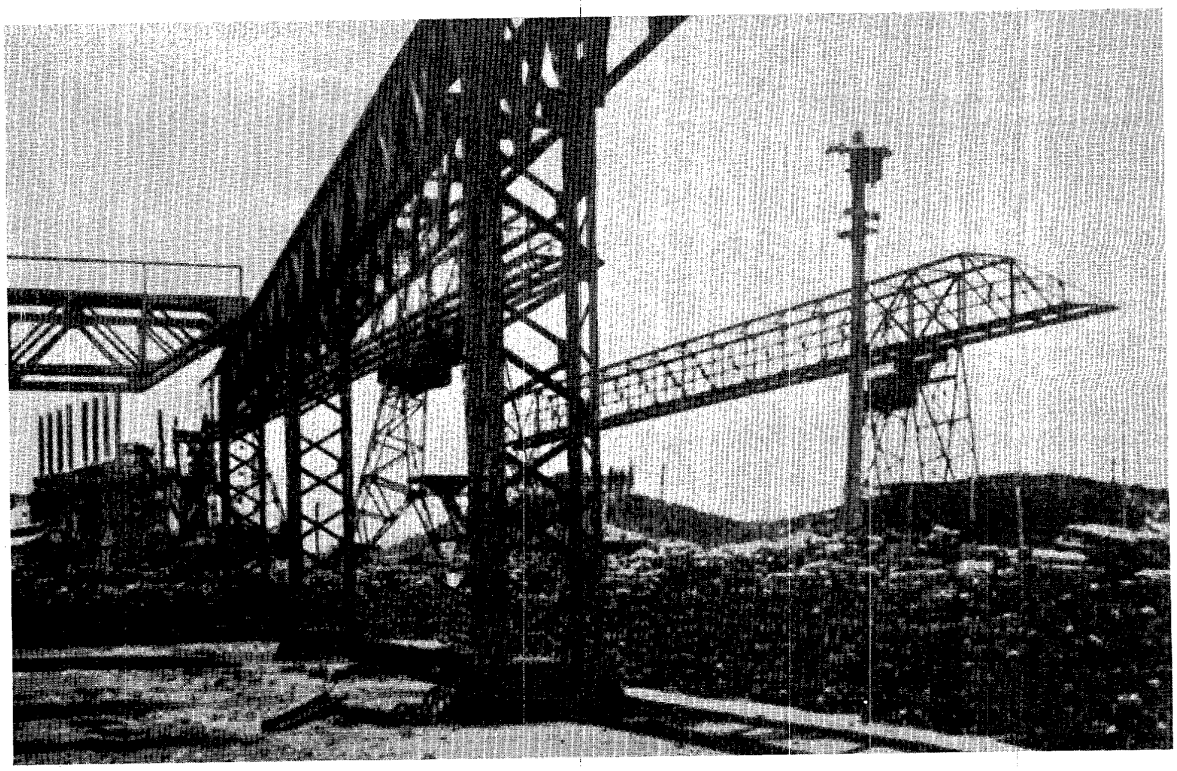

FIGURE VI - 83. *Kyomip'o.*
West plate and shape storage area (Reference ⑤) with traveling overhead crane and bridge, looking northeastward. 1932.

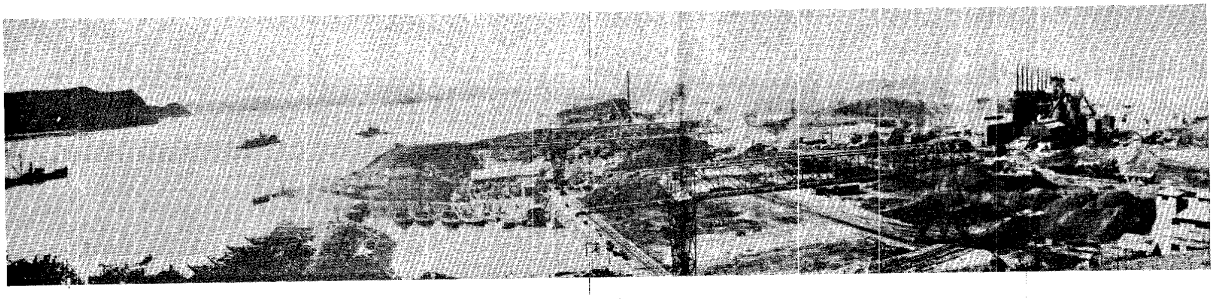

FIGURE VI - 84. *Kyomip'o.*
Lighter basin (Reference ⑥) and traveling bridge cranes, looking northwestward.

Length:	1,000′.
Depth alongside:	Dries at low water.
Storage:	Plate and shape storage area—80′ by 350′.
Cranage:	1 overhead traveling crane works area with runways cantilevering over river; spans 80′, and travels 800′ *at right angles* to quay.
RR:	3 RR spurs encompassing storage are joined at wharf; lead from mills.
Remarks:	Worked by lighters.

East plate and shape storage quays (Reference ⑦); details follow:

Purpose:	Lightering of steel products for export.
Construction:	Probable concrete-faced marginal wharf.
Length:	700′.
Depth alongside:	Dries at low water.
Storage:	Plate and shape storage area—100′ by 800′.
Cranage:	1 traveling bridge crane cantilevering over quay spans entire storage area of 100′, and travels 800′ *parallel* with quay.
Roads:	Roads to railroad in vicinity leading from mills.
Remarks:	Worked by lighters.

Supply dump pier (Reference ①); details follow:

Purpose:	Serves supply dump (Reference ②).
Construction:	Probable wood deck on log piling.
Length:	150′ (face, 26′).
Depth alongside:	Dries at low water.
Storage:	Storage area immediately to rear—80′ by 150′; serves supply dump (Reference ②).
RR and roads:	Road leads from boat pier through supply dump area. RR spur about 400 yds. away.
Remarks:	Has 2,400′ of adjoining beach area.

(3) *Storage facilities.*

(*a*) *Warehouses.* Extensive storage facilities are probably available at the Japan Iron Works but which of the numerous buildings are warehouses is not known.

Beyond the western edge of the town is a large supply dump area (Reference ②) for probably munitions storage. The supply dump, enclosed by wire fence, contains tanks, and numerous storage buildings. The area is accessible by road, rail, and water. The 17 known storage buildings in the area have a total ground space of 91,925 square feet. TABLE VI - 18 lists the storage buildings in the supply dump area.

TABLE VI - 18

WAREHOUSES IN SUPPLY DUMP AREA AT KYOMIP'O

NUMBER	LENGTH (FT.)	WIDTH (FT.)	TOTAL GROUND SPACE (SQ. FT.)	REMARKS
11	80	50	44,000	Widely dispersed and built against surrounding hills. N of above are 8 buildings 3 largest of which are storage buildings.
3	125	35	13,125	
2	230	60	27,600	
1	120	60	7,200	
17			91,925	

(*b*) *Open storage.* One plate and shape storage area (80 feet by 350 feet) is behind Reference ⑤, another such area (100 feet by 800 feet) is behind Reference ⑦). There are also slag dumps and ore bins (500 feet by 45 feet) at the Japan Iron Works. The ore bins have direct railroad connections to iron mines and to the ore storage area at the lighter basin (Reference ⑥).

A newly developed area (Reference ⑧), probably used for ore storage, lies about 1 mile southeast of the Japan Iron Works just north of the new course of the Hwangju-gang (river). The river has been dammed to the north to redirect its course and the old river bed is being reclaimed. Extensive railroad spurs in the area lead to the iron works. Construction activity in progress indicates possible plans for industrial expansion. Overhead ore conveyors work an area 300 feet by 500 feet. The feeder-conveyors lead to a central conveyor which passes through treatment buildings.

(4) ***Capacity and clearance.***

(*a*) *Actual annual traffic.* In 1934, 146 steamers with an aggregate tonnage of 257,238 tons entered port. Vessels from steamship lines operating in the Yellow and Japan Seas sometimes enter Kyomip'o harbor. Motor launches ply the Taedong-gang (river).

(*b*) *Estimated capacity.* The estimated unloading capacity by ship's gear is 2,000 long tons per day from 4 Libertys riding at anchor. Owing to the lack of alongside berths for large vessels, all cargo is worked in the stream. Seasonal and tidal difficulties are encountered in offshore unloading. The basin and adjoining areas dry alongside at low water with the result that lighters can gain access to shore facilities at high tide only. During strong winds, heavy swells may set in the roadstead. During the ice season (from about the beginning of January to the middle of March), working cargo in the stream is impossible.

(*c*) *Clearance facilities.* A standard-gauge, single-track railroad line and a primary highway run from Kyomip'o 8 miles southeastward to Hwangju, junction with the Sinuiju - Kyongsong standard-gauge, double-track line and primary highway.

A single-track, standard-gauge mining line connects Kyomip'o with Mosongpang (Boseibo, Mangsongbang) to the east. An unimproved road trends northeastward from Kyomip'o through Samgap'o and Taesamdu-dong and joins the Sinuiju-Kyongsong primary highway close south of Hukkyo-ri. Small launches and barges can reach the large city of P'yongyang, about 25 miles upstream.

(5) ***Supplies.***

Two water boats are in the harbor with a capacity of 30 to 40 tons per hour each.

TABLE VI - 19 lists the known fuel tanks at Kyomip'o.

TABLE VI - 19

FUEL TANKS AT KYOMIP'O

REFERENCE AND LOCATION	NUMBER	DIAMETER	REMARKS
② NE section of supply dump.	1	125′	
② NE section of supply dump.	2	70′	Contents unknown.
③ NW of coal plant.	2	40′	Onshore; probable fuel tanks.
③ SE of above.	3	40′	125′ offshore, probable fuel tanks.

Coal and some briquettes are available.

Y. Dasado.

(39°48′N, 124°25′E)

Dasado (Taedasa-do, Tashi-tō), a newly developed ice-free port at the mouth of the Yalu River (PLAN 34), has become an important shipping point for southern Manchuria. Formerly used merely as an anchorage for Yongamp'o, 15 miles farther up the Yalu River, Dasado has undergone extensive harbor improvements and now handles most of the cargo bound to and from the growing industrial area in the Yalu River basin, including An-tung, Sinuiju, and the Tung-pien-tao iron-ore fields. Cargo is transshipped into steel barges of 2,000 to 3,000 tons which navigate the river; cargo is also cleared by rail and road. Although Dasado is ice free, upstream from Dasado the river is frozen from about the first of November to the first of May. There are several war industries at Dasado producing aluminum, zinc, lead, and iron. A new airplane factory is reported near Dasado. It is also reported that a military and naval base is being developed.

A 20-mile-long entrance channel leads through drying banks to the port. Least depths in the entrance are not known but are probably between 3 and 4 fathoms. Anchorage is available in good protection for one 6,000-ton vessel in depths of 16 to 33 feet over mud and sand. Temporary anchorage is available 3 miles south of Taedasa-do. Three reportedly completed concrete wharves (650 feet by 130 feet) can accommodate three 6,000-ton vessels; 3 other wharves are probably completed. Cargo is also worked into lighters and barges from one 6,000-ton vessel at anchor.

(1) ***Harbor.***

Construction on the artificial harbor of Dasado which includes the two islands of Sodasa and Taedasa, was started in 1938 and is scheduled to be completed in 1946. The port will handle a contemplated 1,000,000 tons of freight per year. Sodasa-do has been joined to the mainland by a mole 7,500 feet long with a further projected extension of 3,200 feet towards Taedasa-do (FIGURE VI - 85). Over 36,000 square yards of riverfront has been reclaimed, providing space for quays, landing places, cranes, warehouses and railroad facilities, but extent of such construction is not known.

The harbor is protected by the mainland and by various offshore banks which lie southward of Dasado and dry at low

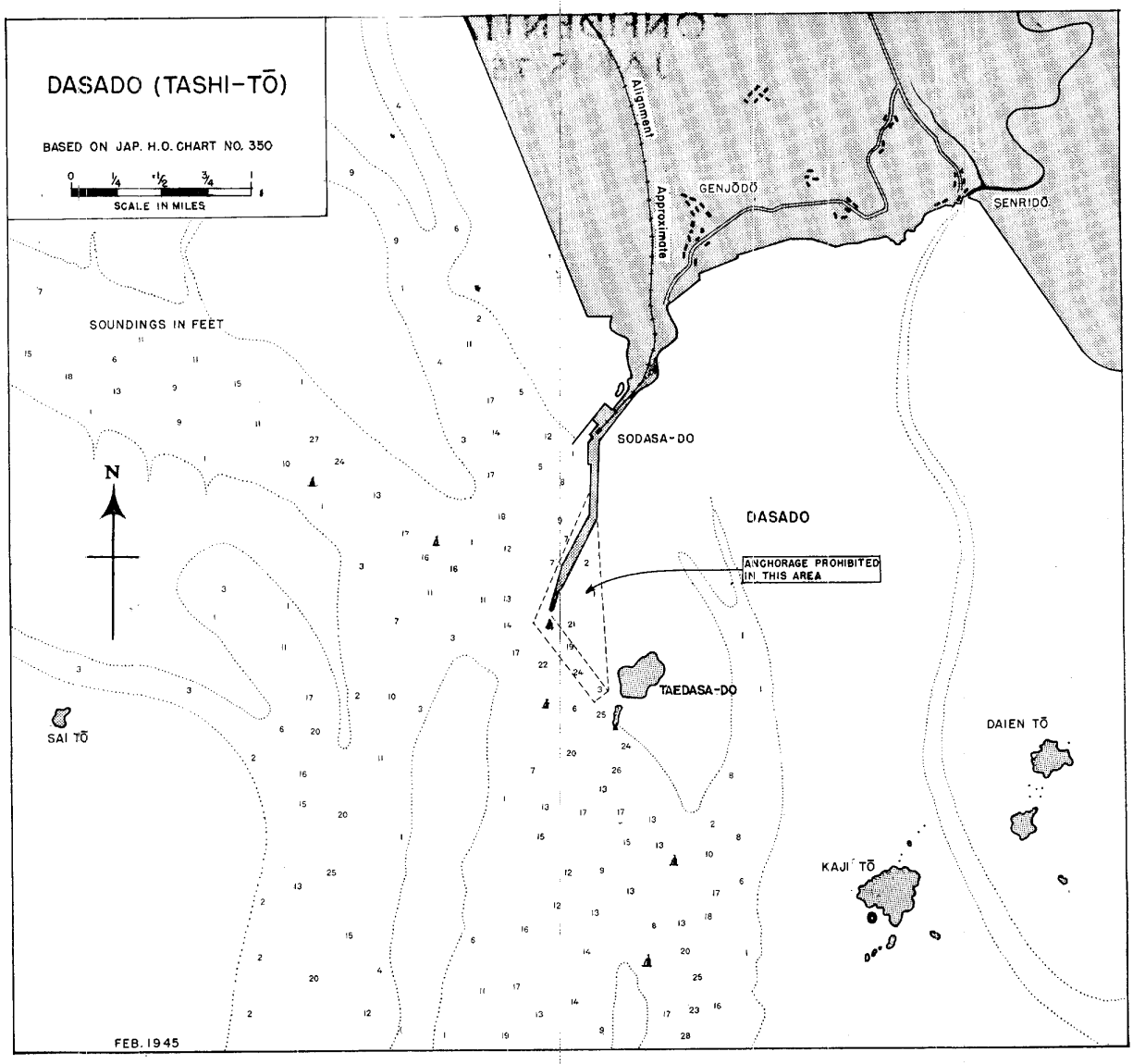

FIGURE VI - 85. *Dasado.*
Sketch of harbor.

water. During the occasional westerly winds, swells may occur at high tide; however, the waves never exceed 4 feet. Vessels have no difficulty in anchoring, but working cargo into lighters is frequently impossible; however, near low tide the harbor becomes calm.

Vessels of over 2,000 tons and drawing over 13 feet, with cargo for Yongamp'o or Sinuiju - An-tung work their cargo in the Dasado harbor into 2,000- to 3,000-ton steel barges which ascend the river. Dasado was formerly a part of the Yongamp'o harbor with common harbor boundary lines, but in 1936 it was designated as an independent port.

(*a*) *Entrance channel.* A 20-mile-long channel leads from the open sea through numerous drying banks to Dasado. The channel is part of Tong-sudo (Higashi-suidō), the eastern entrance channel to the Yalu River. Vessels should keep in mid-channel passing westward of Suun-do (Suiun-tō) and eastward of Un-do (Un-tō) (PLAN 34). Least depths are not known but are probably between 3 and 4 fathoms. The channel was marked by red conical buoys on the eastern side and black conical buoys on the western side. Local knowledge is necessary.

(*b*) *Anchorage.* Owing to the harbor construction in progress, the former Dasado anchorage area off Taedasa-do is no longer used. The best anchorage is available about 1,000 yards west of the northern tip of Taedasa-do, in depths of 16 to 33 feet over mud and sand. At present only one 6,000-ton steamer can be accommodated here. Formerly, three 6,000-ton steamers could anchor in this vicinity. Caution is necessary to avoid dragging anchor during the strong flood current, and it is difficult to bring lighters alongside during this period. Temporary anchorage for vessels waiting to anchor or berth alongside at Dasado is found 3 miles south of Taedasa-do.

Anchorage berths are also available above Munback to (Monhaku-tō) between Sojungju (Seichūshū) and Tongjungju (Tōchūshū) for 3 vessels of 100-foot length in average depths of 18 feet.

(*c*) *Significant hydrographic features.* At Dasado the mean high water interval is 9 hours 3 minutes. The springs rise 21 feet; the neaps, 16½ feet; and the mean sea level is 11½ feet.

In the anchorage area and in the western side of Suun-do (Suiun-tō), the tidal streams run in the direction of the channel. At spring tides in summer, the tidal streams at Dasado turn about 1 to 2 hours after high and low water stand without any apparent period of slack water. The maximum rates during spring tides are 3¼ knots for flood stream and 4½ knots for the ebb stream. Westward of Suun-do (Suiun-tō), the maximum rates are 2½ and 2¾ knots respectively.

Navigation of the Yalu River is closed by ice from about the first of November to the first of May. Dasado faces the open sea, ice floes from upstream do not block the harbor, but may hinder the working of cargo in the stream. The ice-flow generally passes through the west side of the anchorage because of the high velocity of the north wind.

(*2*) ***Landing facilities.***

It is reported that as a result of the harbor expansion program, 3 concrete wharves (650 feet by 130 feet) accommodating three 6,000-ton vessels have been completed at Dasado. Three other wharves have been under construction and are probably completed. Prior to this development, all cargo was worked in the stream by lighters.

As part of the expansion program, Sodasa-do was leveled and a warehouse area of 26,575 square feet was constructed.

(*3*) ***Capacity and clearance.***

An estimated 1,200 long tons per day can be discharged alongside the reportedly completed wharves.

A causeway 1,600 feet long and 40 feet wide connects Sodasa-do with the mainland. A primary highway trends northward to Yangsi. An improved road under 12 feet branches off this highway at Paekhyon-dong to Yongamp'o. The standard-gauge Dasado (Tashi-tō) Railroad runs northward through Yongamp'o and Yangsi to Sokha-dong where it joins the double-track standard-gauge Pusan-Mukden line.

Cargo is cleared in barges up the Yalu River. Vessels drawing 12 feet and less can reach Sinuiju - An-tung about 25 miles upstream from Dasado. Junks can go about 175 miles upstream. From about December through March vehicles can travel on the frozen river.

Z. Yongamp'o.

(39°57'N, 124°22'E)

Yongamp'o (Ryūgampo), about 15 miles north of Dasado (Taedasa-do, Tashi-tō) on the Yalu River (PLAN 34), is reported to be the site of a new industrial area constructed on newly reclaimed land. A lead smelter owned by the Sansei Mining Company is located here, and an arsenal and explosives factory are reported under construction.

Ice closes the port from about the first of November to the first of May.

Vessels of between 1,000 and 2,000 tons, drawing not more than 13 feet can anchor about 1½ miles off Yongamp'o, and work cargo into lighters. Steel barges of 2,000 to 3,000 tons receive cargo from larger vessels at Dasado, and carry to Yongamp'o and Sinuiju - An-tung; at Yongamp'o they probably work cargo into lighters. There is one pier which can be used at high tide by small craft.

(*1*) ***Harbor.***

Yongamp'o is separated from the Yalu River's course by a large swamp area which at low tide extends to the vicinity of Turyup'o (Toryupo), southwest of Yongamp'o (FIGURE VI - 86). This land leaves only one narrow and shallow waterway which connects the port with the main fairway and which can be used by small craft and fishing vessels at high tide. Although the river bank is marshy swampland, a retaining wall of stakes and boards has been constructed to prevent the erosion of the mud.

(*a*) *Entrance channel.* Vessels drawing not more than 13 feet can reach Yongamp'o anchorage, about 1½ miles northwest of the city. Approach is made through the Tong-sudo (Higashi-suidō) or Sosudo (Nishi-suidō). So-sudo is the most used. Tong-sudo is subject to changes in its northern port. The 2 channels unite just within the river proper, 2 miles below Yongamp'o. The fairway runs eastward for 2 miles and then turns sharply to the north to the Yongamp'o anchorage. The fairway was marked by red conical buoys on the eastern side and black conical buoys on the western side; the buoys were often moved because of changes in the fairway.

(*b*) *Anchorage.* Vessels of more than 2,000 tons work their cargo in the Dasado (Taedasa-do, Tashi-tō) anchorage, 15 miles south of Yongamp'o. However, vessels of less than 2,000 tons and drawing less than 13 feet can proceed to the anchorage off Yongamp'o, approximately 1½ miles northwest of the city. Three vessels of between 1,000 and 2,000 tons can be accommodated here. It is a mediocre anchorage with a sandy mud bottom. The water depth at high tide is 30 feet, at low tide 17½ feet; however, depths show great seasonal variation. Vessels work their cargo in the stream by lighters.

Large vessels with cargo bound for Yongamp'o or Sinuiju - An-tung transship the cargo at Dasado into steel barges of 2,000- to 3,000-tons which can ascend the river. At Yongamp'o these barges probably moor in the anchorage and work cargo into lighters.

(*c*) *Significant hydrographic features.* The spring rise is 15 feet, the neap rise, 13 feet; and the mean sea level is 8½ feet. The mean high water interval is 9 hours 20 minutes. The tides in the Turyup'o (Toryūpo) and Yongamp'o vicinity are greatly affected by the current of the Yalu River and consequently have a great seasonal variation. In May and June the tidal streams turn one hour after stand. The flood current flows at a rate of 2.5 knots; and the ebb tide, at a rate of 3 knots. During July and August the flood current is scarcely apparent, while the ebb flow increases and reaches a maximum velocity of 5 knots. Communication with the shore is sometimes made difficult by these strong tidal and river currents.

Navigation of the river is closed by ice from about the first of November until about the first of May. When the ice breaks, the drift ice in the main stream above Yongamp'o is confined to a limited area by the action of the tides, and practically none of it is seen outside the river mouth.

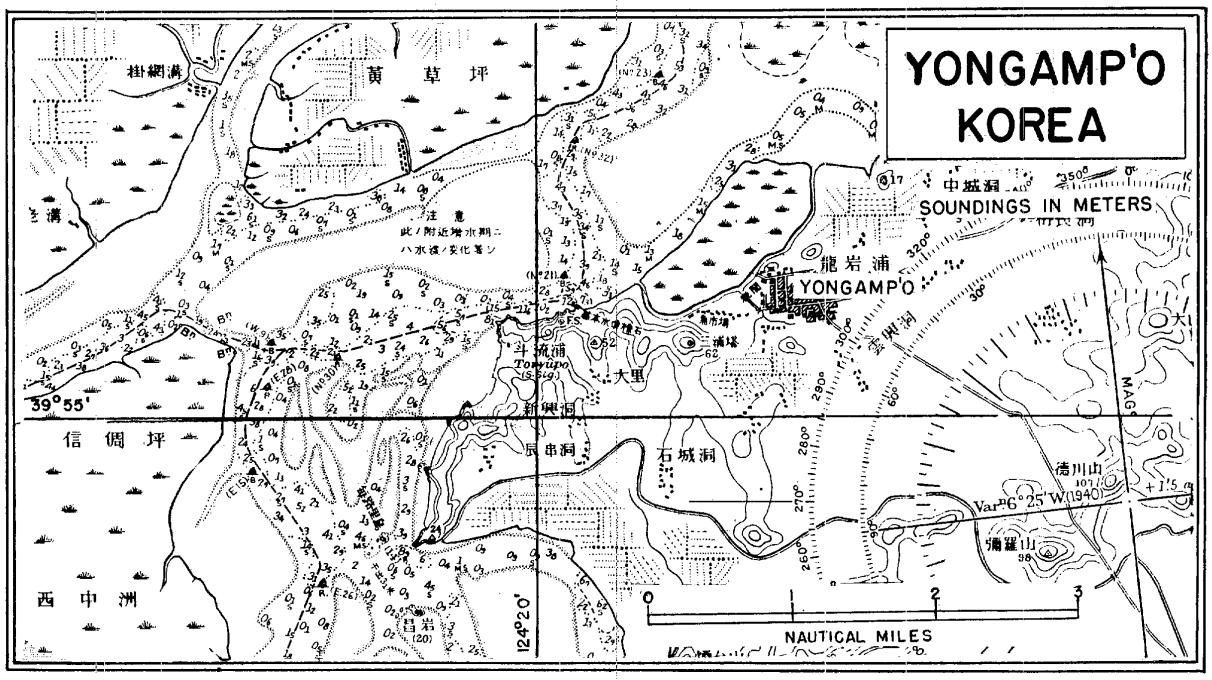

FIGURE VI - 86. *Yongamp'o.*
Map of harbor.

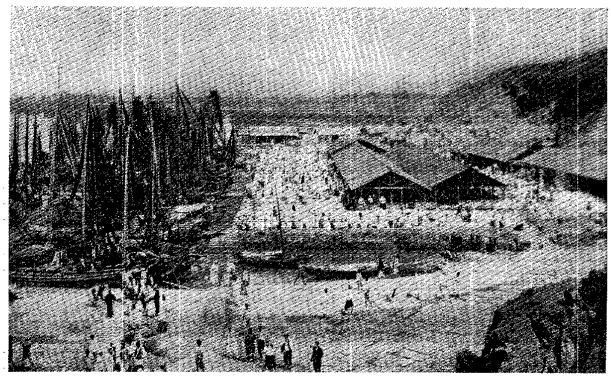

FIGURE VI - 87. *Yongamp'o.*
Fish storage sheds on beach.

(2) Landing and storage facilities.

There is 1 pier under the management of the Isara Commerce Company reported at Yongamp'o. It is constructed of wood with a length of 72 feet and a width of 8 feet. It can be used only at high tide by small craft.

On the east side of a small island near the river bank a lumber storehouse is reported. Several other warehouses and open sheds in the area are available, but nothing specific is known about the number or dimensions. Several large fish storage sheds are on the waterfront (FIGURE VI - 87); their exact location is not known.

(3) Clearance.

Motor launches ply the river between Yongamp'o and Sinuiju regularly each day, but this route is closed by ice from about the first of November to about the first of May. Vehicles can travel on the ice during some of this period. Primary highways and improved roads over 12 feet wide connect Yongamp'o with Yangsi and Sinuiju to the north and Dasado (Taedasa, Tashi-tō) to the south. A single-track, standard-gauge railroad line, Dasado (Tashi-tō) Line, runs from Yongamp'o through Yangsi to Namsi-dong where it joins the Pusan - Mukden line.

(4) Supplies.

Fresh water is available from a well at the customs house but there is no equipment for laying it aboard ships. There is a scarcity of bunker coal and firewood.

AA. Sinuiju (Shingishū) - An-tung.

(40°06′N, 124°24′E; 40°09′N, 124°23′E)

The twin cities of Sinuiju and An-tung are on opposite banks about 17 miles above the mouth of the Yalu River (Amnok-kang), the boundary between Korea and Manchuria. Yongamp'o is at the mouth of the river and Dasado (Taedasa-do) is southward of the mouth. Sinuiju - An-tung is a major lumber and paper center, and an important railroad shipping point. Timber from the Yalu River valley is milled and shipped. War industries in the area produce light metals, chemicals, explosives, and alcohol. As a railroad gateway between Korea and Manchuria, Sinuiju - An-tung have large railroad marshalling yards and railroad repair facilities. Two railroad bridges span the river and connect the cities. Extensive facilities for repairing and constructng small craft are available.

Irregular depths in the river harbor range from 3 to 15 feet with scattered shoals. Access to the harbor is limited to coasters of less than 1,000 tons, drawing 12 feet or less. The mouth and estuary of the river are encumbered with sand and mud banks. Large vessels anchor in the estuary of the river, near Dasado (Taedasa-do) and transship cargo to and from Sinuiju - An-

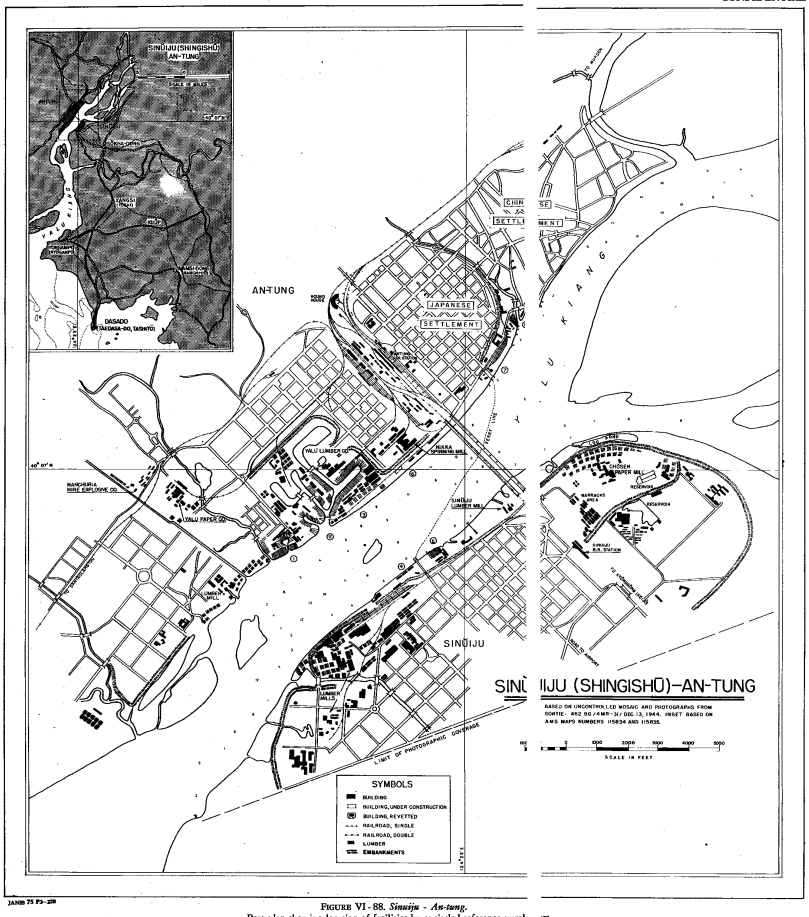

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FIGURE VI - 88. *Sinuiju - An-tung.*
Port plan showing location of facilities by encircled reference numb ers.

tung via 2,000- to 3,000-ton steel barges. Ice closes the river to navigation from the end of October to the first of May; vehicles travel on the surface during some of this time.

The waterfront along both banks of the river has been quayed or bulkheaded for a total length of 11,900 feet. The principal quays and warehouses are on the An-tung bank. Berthage is provided for small coasters and 2,000- to 3,000-ton steel barges. At least 64 known warehouses provide about 777,750 square feet of covered storage; extensive open storage facilities are available to handle lumber, the port's chief cargo. Several basins—one part of a lumber company compound, and several small boatyards provide over 200 slipways for small craft. Some may be used for unloading logs and the handling of lighters during the ice season.

(1) Harbor.

Sinuiju and An-tung are separated by the 760-yard-wide Yalu River (FIGURE VI - 88). Several large sand bars and islets are in the harbor; they divert the river's course. As the current of the Yalu River sets toward the An-tung bank, the water is deeper on the An-tung side, and most of the anchorage berths and shore facilities are located along An-tung. Depths in the harbor are extremely irregular ranging from 3 to 15 feet with scattered shoals. Access to the harbor can only be gained by coasters of less than 1,000 tons.

(a) Entrance channel. The mouth and estuary of the Yalu River are encumbered with numerous sand and mud banks, lareg areas of which dry. The only practicable channels through these banks are the Tong-sudo, on the eastern side of the estuary, and the So-sudo, on the western side. The other channels are narrow and constantly shifting. So-sudo is the fairway most generally used as the northern part of Tong-sudo is liable to shift, and the depths are continuously changing. Both channels unite just within the entrance to the river, about 2 miles below Yongamp'o. The fairway runs eastward from here about 2 miles and then turns abruptly to the north winding its way past Sinuiju and An-tung. The fairway was marked by red conical buoys on the starboard hand and black conical buoys on the port hand. The buoys are removed every year while the river is frozen, and are gradually replaced as it thaws; they are also shifted or altered without announcement to conform with alterations in the channel or depths.

Due to the shifting nature of the fairway, a midchannel course should be steered up the Yalu River. Vessels drawing less than 13 feet can proceed to Yongamp'o, 2 miles above the mouth of the river, in depths ranging from 10 to 30 feet; vessels drawing 12 feet and less can proceed to the Sinuiju - An-tung anchorage, 15 miles above Yongamp'o, in depths ranging from 5 to 20 feet. As the river bottom is composed of fine sand, a vessel will not usually be damaged if she grounds or scrapes bottom. In some places there are sudden drops where the depths change abruptly from 8 to 18 feet, and a vessel grounding here may capsize when the tide falls. If a vessel gets across the stream after grounding, she will cause an eddy which will scour out the sand above her and pile it up below, so that she will be gradually buried.

(b) Anchorage. Large vessels, bound for the Sinuiju - An-tung area, must work their cargo at the Dasado (Tashi-tō, Taedasa-do, Daitasa-tō) and Sin-do anchorages, at the estuary of the Yalu River. Cargo is transshipped to and from Sinuiju - An-tung by means of 2,000- to 3,000-ton steel barges. Vessels of 2,000 tons can work their cargo at Yongamp'o, 15 miles down stream, or San-tao-lang-t'ou, 5 miles downstream from Sinuiju - An-tung; however, access to San-tao-lang-t'ou is difficult even at high tide.

At Sinuiju - An-tung the anchorage extends downstream for 1½ miles below the railway bridges with the greater depths along the An-tung bank. There is good holding ground over sand and mud in average depths of 10 feet ranging from 4 to 14 feet. Due to the change in river bottom and water depths, the best positions in the anchorage shift from year to year. As a result of the congested harbor, vessels moor with 2 anchors heading into the current.

(c) Significant hydrographic features. Although the Sinuiju - An-tung harbor is about 15 miles from the mouth of the Yalu River, it is affected by tides as well as river currents, with a tidal range of 6 to 9 feet. The mean high water interval is 10 hours 50 minutes. The springs rise 10 feet; neaps, 7½ feet; and the mean sea level is 5 feet.

The tidal currents are subject to seasonal variations due to the river currents; consequently in the flood period of July and August, the flood current is scarcely apparent while the ebb flow reaches a maximum rate of 6 knots. In May and June the flood current flows at a rate of 2 knots; and the ebb current, at a rate of 2.8 knots. During this period the tidal currents turn one-half hour after high and low water stand.

(d) Local weather. In the winter, ice on the river freezes to a thickness of 3 feet, and the river is closed to navigation from the end of October to the first of May. During some of this period vehicles travel on the surface of the ice to the ports on the Yalu River.

In summer August is the hottest, and in the average year it surpasses a maximum of 86° F. In winter January has the lowest temperature, and it often reaches 5° F. and below.

The direction of the wind is virtually fixed according to the season. In April and May a west wind prevails; between June and August, a south wind; and from September to March, a north wind prevails. Wind velocity averages 5 knots and between June and September it is generally weak. However, in winter, the wind velocity exceeds 6 knots. Occasionally the wind velocity exceeds 43 knots from the south.

The rainy season occurs between July and August. The Yalu River frequently overflows causing extensive damage. As the erosion of soil and sand is great, great variations occur in the river bottom which affect navigation on the river.

Fog sets in from January to April and November to December, but visibility for navigation is not impaired.

Snow falls from November to April but the snow drifts rarely exceed 10 feet; due to the severe cold, the snow does not melt readily and lasts until the thaw sets in.

(2) Landing facilities.

The principal quays and warehouses of the Sinuiju - An-tung area are on the An-tung bank between the customs house, above the bridges, and the lumber mills, below the bridges. The alongside berths will accommodate small coasters and 2,000- to 3,000-ton steel barges. The chief cargo handled is

TABLE VI - 20

WAREHOUSES IN THE SINUIJU - AN-TUNG AREA

LOCATION AND REFERENCE NO. ON FIGURE VI - 88.	NUMBER	WIDTH (FT.)	LENGTH (FT.)	TOTAL GROUND SPACE (SQ. FT.)	REMARKS
Sinuiju					
④ On Sinuiju lumber quay	1	60	190	11,400	Area served by RR spur which parallels quay. 50-track dock siding yard to west of quay. Warehouses store material for lumber industries.
	1	60	160	9,600	
	1	40	40	1,600	
	2	40	160	12,800	
	1	40	145	5,800	
	1	40	100	4,000	
	2	40	85	6,800	Possible storage buildings.
	1	40	150	6,000	
④ W of lumber quay, S of W siding yard	1	100	850	85,000	Storage type buildings SW of dock siding yards.
	1	130	230	29,900	
	1	130	450	58,500	
	1	60	400	24,000	
	1	60	700	42,000	
An-tung					
① Surrounding T-shaped boat yard on SW end of city	1	50	115	5,750	These are construction, storage and repair sheds used by boat yard.
	2	50	75	7,500	
	2	40	250	20,000	
	1	50	110	5,500	
	1	30	100	3,000	
	3	30	70	6,300	
② Surrounding first finger of large boat and lumber basin below RR bridges	1	50	250	12,500	Storage and boat construction sheds.
	2	115	200	46,000	
	4	40	130	20,800	
	6	40	90	21,600	
② Surrounding third finger of section of boat basin below RR bridges	2	40	250	20,000	Storage and repair sheds also serve second finger of boat basin by RR spur from north.
③ To rear of An-tung lumber quay	4	45	125	22,500	These buildings are connected with lumber quay and mills. Served by same RR spur as above warehouses.
	5	40	190	38,000	
	2	45	250	22,500	
	1	150	170	25,500	
⑥ To rear of Manchuria Railway Quay	1	75	220	16,500	RR spur to rear of buildings. Constructed of galvanized iron. Known capacity for 3 of warehouses is 12,700 tons.
	2	75	280	42,000	
	1	85	200	17,000	
⑦ and ⑨ On N Quay No. 1 and No. 2 above RR bridge	1	40	260	10,400	Road and flood embankment to rear of buildings.
	1	30	200	6,000	
	1	30	100	3,000	
Within large marshalling yards. West unit	1	90	260	23,400	Probably include railway repair sheds.
	1	60	290	17,400	
	1	60	540	32,400	
	1	60	330	19,800	
	1	60	250	15,000	
Totals	64			777,750	

lumber. Steel barges and a large number of lighters and small craft are at the port (FIGURE II - 76).*

The waterfront in the Sinuiju - An-tung area has been quayed or bulkheaded for a total length of 11,900 feet, of which 9,700 feet is along the An-tung bank, and 2,200 feet along the Sinuiju bank.

An-tung Lumber Quay (Reference ③)**; details follow:

Location:	SW of RR bridge, below Manchuria Railroad Quay (Reference ⑥).
Operated by:	Probably Yalu Lumber Co.
Construction:	Stone and wood bulkheads.
Length:	1,100′ + 1,200′.
Depth alongside:	8′.
Width of apron:	Open apron on eastern half.
Storage:	3 storage buildings on quay; open storage space in area covers approximately 33,000 sq. yds.
RR:	RR spur parallel with quay behind warehouses.

South Manchuria Railway Quay (Reference ⑥); details follow:

Location:	Below RR bridge on An-tung bank.
Operated by:	South Manchuria Railroad.
Construction:	Stone gravity wall.
Length:	2,400′.
Depth alongside:	11½′.
Berthage:	Small coasters and 2,000-3,000-ton lighters.
Width of apron:	85′.
Storage:	4 large storage sheds behind apron; loose lumber stores on apron.

* Aerial photograph, Chapter II.

** References are encircled numbers on FIGURE VI - 88.

FIGURE VI - 89. *Sinuiju - An-tung.*
Open storage for lumber at Sinuiju mill. Before 1930.

Cranage:	Reported one 3-ton crane. 2 floating cranes.
RR:	Railroad spur behind storage sheds, extends to Lumber Quay.

North Bridge Quay No. 1 (Reference ⑦); details follow:

Location:	Above bridge to mouth of small river on An-tung bank.
Construction:	Sloping stone gravity wall.
Length:	3,600′.
Depth alongside:	6½′.
Width of apron:	Open.
RR:	Freight siding yard 180′ to rear with 1 spur skirting entire area.
Remarks:	7 small wooden piers extending from quay; length 30′ to 40′; includes 1 ferry pier for service to Sinuiju; Quays No. 1 and 2 interrupted by mouth of small river.

North Bridge Quay No. 2 (Reference ⑨); details follow:

Location:	Above Quay No. 1 on An-tung bank.
Construction:	Sloping stone gravity wall.
Length:	1,400′.
Depth alongside:	6′.
Width of apron:	125′ to 280′.
Storage:	10 storage buildings (TABLE VI - 23); open stores area 41,000 sq. yds.
RR:	RR spur 220′ to rear of quay; transshipment railroad yard to W of quay.
Remarks:	Sinuiju ferry pier on E end of quay, 90′ long, 30′ wide. Small wooden pier 1,200′ to E of quay; 40′ long; 90′ wide.

Sinuiju Lumber Quay (Reference ④); details follow:

Location:	S of railway bridge.
Purpose:	Lightering of wood products.
Construction:	Probable stone gravity wall.
Length:	2,200′.
Depth alongside:	6′.
Width of apron:	125′ to 280′.
Storage:	Open stores area 125′ by 3,000′. 10 storage buildings on quay and 5 to W of quay.
RR:	Railway siding yard SW of quay.
Remarks:	A pier 40′ by 90′ located 1,200′ upstream from quay; another pier 30′ by 90′ at northern end of quay.

(3) *Storage facilities.*

(*a*) *Warehouses.* Numerous storage buildings are located in the Sinuiju - An-tung area, primarily connected with the extensive lumber industry. There are at least 64 known warehouses covering a total ground space of 777,750 square feet in the area. TABLE VI - 20 lists the storage buildings available at Sinuiju and An-tung, including those near the landing and repair facilities as well as those already listed in connection with landing facilities.

(*b*) *Lumber storage.* Extensive open-air storage facilities are available. Lumber is stored in numerous ponds and open areas along the Yalu River (FIGURE VI - 89). Logs are floated down from the lumber camps above the Sinuiju - An-tung area, collected at the mills in various canals and ponds, and hauled to the saws by hand. Tamarack, red pine, and white fir, as well as other types of heavy building lumber are handled. Most of the lumber is shipped out by water.

(4) *Capacity and clearance.*

(*a*) *Actual annual traffic.* In 1935, a total of 22,103 vessels with an aggregate tonnage of 126,869 tons entered the harbor, including 253 steamers with an aggregate tonnage of 2,068 tons. Various mail coastal steamers maintain service between Sinuiju - An-tung, and Shanghai, Tientsin, Dairen, Japan, and the principal ports of call of western Korea. Numerous sampans ply the Yalu River to various ports on the river, and ferry service is maintained between Sinuiju and An-tung.

(*b*) *Facilities for clearing port. Railroads.* Sinuiju and An-tung are 2 of the principal railroad gateways between Manchuria and Korea (FIGURE VI - 90). The South Manchurian Railway system joins the Korean Railways over the 2 steel bridges connecting An-tung with Sinuiju. The 2 single-tracked Yalu River bridges have swinging midsections to permit passage of vessels. Both bridges—the upstream one was recently constructed—are 1,000 yards long.

Sinuiju is the terminal station of the standard-gauge double-track Kyongui trunk line which runs from Sinuiju to Kyongsong, junction with the Keifu Trunk Line, and other branch lines. The Dasado (Taedasa-do) single-track line trends north from Dasado (Taedasa-do) to Sokha-dong, about 3 miles east of Sinuiju, where it joins the Kyongui Trunk Line. Within Sinuiju a 50-track transshipment railroad yard is to the rear of the Sinuiju Lumber Quay (Reference ④).

An-tung is the terminal station of the standard-gauge, double-track An-tung - Mukden Railroad Line operated by the South Manchurian Railway Company. The reportedly completed

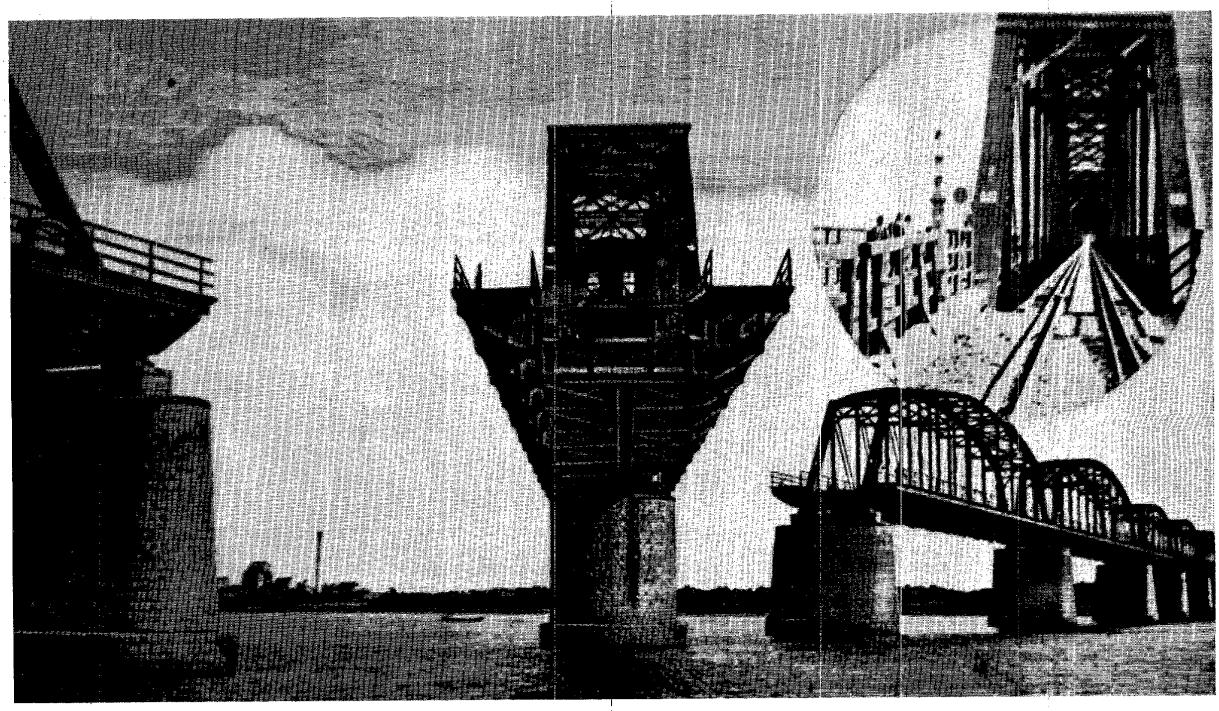

FIGURE VI-90. *Sinuiju - An-tung.*
Yalu River railroad bridge connecting Sinuiju and An-tung.

single-track standard-gauge An-tung - Dairen line runs from An-tung along the southern coast of the An-tung Province through San-tao-lang-t'ou, Ta-tung-kou, Ta-ku-shan, Chuang-ho, and Dairen. A large spindle-shaped marshalling yard in 2 units is at An-tung to the north-northwestward of the Yalu River bridges. The westernmost yard contains 22 spurs, and the easternmost, 14 spurs. Spurs are on or near the quays on the An-tung side (References ③⑥⑦⑨).

Roads. Networks of roads honeycomb the Sinuiju - An-tung area. A primary highway from Sinuiju follows the Kyongui Trunk Line to Kyongsong. An improved road, over 12 feet wide, trends northward to Uiju and Okkang Dong. Another improved road runs from Dasado (Taedasa-do) to Sokha-dong. A primary highway also trends north - south from An-tung following the Yalu River northward and the southern shores of the An-tung Province southward. An unimproved road, over 12 feet wide, follows the Antung - Mukden Railroad Line. A network of unimproved roads connects these highways. Streets appear near most of the landing facilities.

(5) *Supplies.*

(*a*) *Water.* In An-tung the Japanese Waterworks Company has a reservoir with a capacity reported in 1934 of 21,600,000 cubic feet. Plans for the expansion of the reservoir have been reported. The water is chlorinated and filtered through a Patterson plant. Wells supplement the supply. Sinuiju water supply comes from the Sinuiju Prefectural Waterworks in the southeast section of the city. Both Sinuiju and An-tung have 1 hydrant each for servicing small craft at the quays. Neither city has water boats for supplying vessels in the stream.

(*b*) *Coal.* The coal supplies at Sinuiju are extremely small, averaging 600 tons of bunker coal on hand. At An-tung a reported supply of 2,500 tons of coal is available in a coal storage area about 1,600 yards upstream from the Yalu River bridge.

(*c*) *Electricity.* Power for the two cities is probably supplied now from the Sup'ung-dong Hydroelectric Plant, 125 miles farther up the Yalu River. Power from this plant supplants that formerly produced at the local power plants which are undoubtedly maintained for emergency purposes.

(6) *Repair facilities.*

Extensive slipways for small craft construction and repair are available at An-tung; however, these ways may be used primarily for unloading logs and haul-out of lighters during the ice season. A total of 186 ways are in a T-shaped basin (Reference ①) and a large multi-finger basin (Reference ②), in the Yalu Lumber Company compound.

Along the riverfront adjoining the east and west entrance to the T-shaped basin (Reference ①) are 20 slipways with an average length of 200 feet. At the head of the basin, which covers an area of 27,000 square feet, there are 18 additional slipways varying from 160 to 200 feet in length.

The greatest concentration of slipways is along the 4 fingers of the large Yalu Lumber Company basin (Reference ②). There are 148 slipways in the basin varying in length from 150 to 200 feet. Numerous storage sheds and warehouses serve this area.

Another small boat repair yard (Reference ⑧), is above the Yalu River bridges at the mouth of a small stream. There are five 350-foot slipways at the yard.

On the Sinuiju bank, a small boatyard (Reference ⑤), with a river frontage of 770 feet is 1,000 yards downstream from

the bridge. There are 15 slipways varying in length from 200 to 270 feet.

63. Other Landings On Korea and Off-lying Islands Of Ullung-do, Tsushima, and Cheju-do

In addition to the principal and secondary ports, there are 10 other landings around the coast of Korea. These are primarily small fishing harbors with facilities for handling small craft only.

To-dong is the port and capital of Ullung-do (Utsuryō-tō), an island about 27 square miles in area, lying about 70 miles off the eastern coast of Korea (PLAN 16). The island is nearly steep-to, with only slight indentations in the coast where temporary anchorage may be had for small craft.

There are at least 4 landings on Tsushima (islands), which are about 40 miles south of the southeastern corner of Korea (PLAN 17). Both the north and south islands of Tsushima are highly indented by numerous bays and inlets of varying size and shape. Consequently, there are harbors on all sides of the islands, but the lack of industries has resulted in the development of few port facilities. However, the island group is a base for an extensive fishing fleet and most of its harbors serve as havens for small craft. At least 4 of the larger harbors are marketing and fitting out centers, have commercial connections with Japan, and have small wharves or piers for the small coasters which call regularly.

There are at least 6 landings on Cheju-do (Saishū-tō), an island of about 675 square miles, lying 47 miles south-southeastward of the southwestern tip of Korea (PLAN 23). The island has few indentations and no secure anchorages or port facilities capable of accommodating large vessels. Cheju is the capital and largest port.

TABLE VI - 21 gives the significant data on the above mentioned landings on Korea, Ullung-do, Tsushima, and Cheju-do.

In addition to the landings listed in the table for Cheju-do, vessels call at the following points on this island; presumably these points have some landing facilities for small craft: Kumnyong (Kinnei), 33°44′N, 126°44′E; Songsanp'o-hang (Jōsanho-kō), 33°26′N, 126°56′E; P'yoson-ni (Hyozen-ri), 33°20′N, 126°50′E; Wim-ri (Imi-ri), 33°16′N, 126°38′E; and Aewol-li (Caigetsu-ri), 33°28′N, 126°20′E.

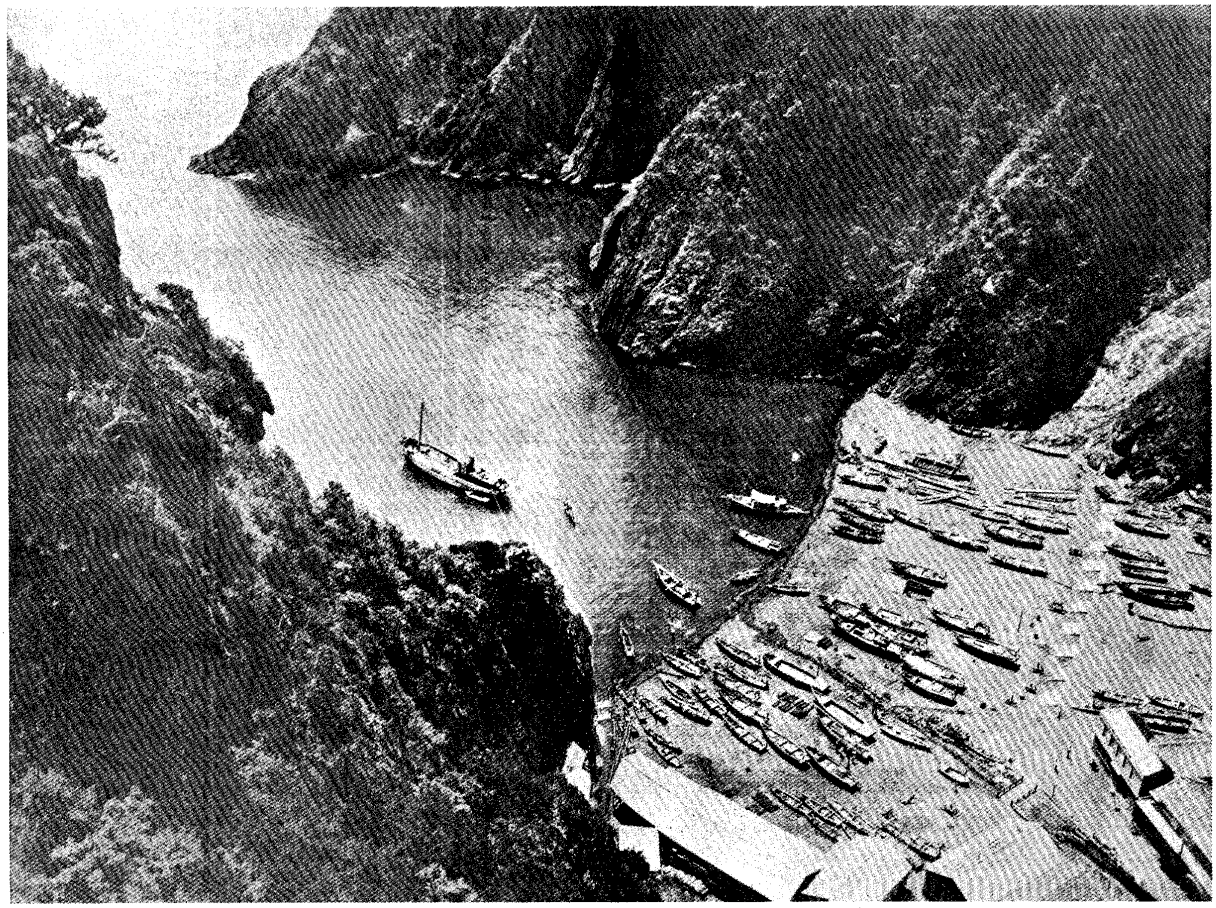

FIGURE VI - 91. *To-dong.*
Small craft on beach.

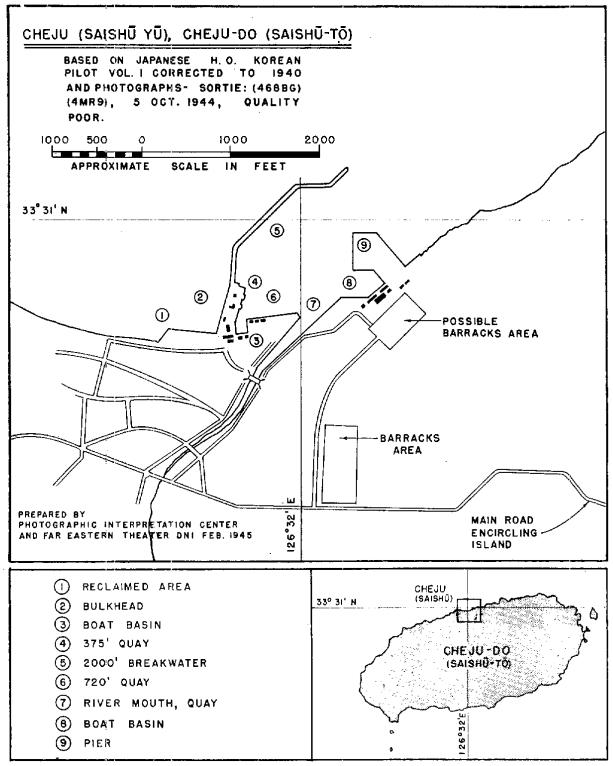

FIGURE VI - 92. *Cheju.*
Port plan showing location of facilities by encircled reference numbers.

64. *Anchorages On Korea, and Off-Lying Islands Of Tsushima and Cheju-do (Saishu)*

Despite its generally smooth contour, the east coast of Korea offers better anchorages than do the highly-indented south and west coasts. Bays large enough to serve as anchorages for medium-sized and large vessels are comparatively rare on the east coast; however, the few east coast bays which serve as anchorages are characterized by adequate depths, negligible tides and currents, and freedom from obstructions.

The myriad bays of the south and west coasts are very shallow, subject to dangerous currents and extreme tidal ranges, and likely to be dotted with bars and reefs. Hence, few of them are suitable for use by medium-sized and large vessels. Anchorages on the coast of Tsushima are generally limited in size and capacity, while Cheju (Saishū) offers no really good anchorages whatever.

TABLE VI - 22 gives significant detail on anchorages of every type, ranging from those at highly-developed ports like Najin to the roadstead anchorages so common on the east coast of Korea. Some basis of selection has been necessary, however, and in general the effort has been made to restrict the listing to anchorages suitable for medium-sized and large vessels. Anchorages available only to small vessels are included where no larger anchorages exist over a long stretch of coastline, or where these smaller anchorages lie off important settlements. Along the south coast of Korea, where there are thousands of small inlets which could qualify as temporary anchorages, a higher degree of selection has been used, and only well-established anchorages are listed. A key to the symbols and standards used in TABLE VI - 22 follows:

FAIRWAY.
A. Wide and clear.
B. Restricted but clear.
C. Wide and obstructed.
D. Restricted and obstructed.

Definition of anchorage berth classifications:

1st Class—A 500-yard-diameter circle in depths of 35 feet or over.

2nd Class—A 400-yard-diameter circle in depths of 25 feet or over.

3rd Class—A 300-yard-diameter circle in depths of 15 feet or over.

Estimates of capacity in TABLE VI - 22 are approximate; in cases of insufficient chart coverage estimates have not been made; the capacity of roadstead anchorages has likewise not been included.

Locations of the anchorages listed in TABLE VI - 22 are indicated by arrows on FIGURE VI - 93, which also locates all ports and landings. The numbers accompanying the arrows refer to the numbers assigned to anchorages in TABLE VI - 22.

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TABLE VI - 21

OTHER LANDINGS ON KOREA AND OFF-LYING ISLANDS OF ULLUNG-DO, TSUSHIMA, AND CHEJU-DO

A. Korea.

NAME AND LOCATION	HYDROGRAPHIC FEATURES	ENTRANCE CHANNEL	ANCHORAGES	LANDING FACILITIES	COMMERCE	REMARKS
Chongha-ri (37°25′36″N, 129°11′35″ E).	Tides rise up to 0.7′; equinoctial tide mean high water interval is 3 hrs., 10 min.; tropic tide, 1 hr., 55 min.	Approximately 180′ wide at narrowest point; depths of 8′ restrict its use to small craft.	Maximum of 2 third-class anchorage berths in protected area.	Pier, 240′ long with depth of 16′ alongside the end. Approximately 1,800′ of landing space in the canal with depths of ½′ to 5′ alongside.	587 steamships of 105,688 tons and 731 sailing vessels of 40,125 tons entered port in 1936.	Small fishing harbor at mouth of Onjo-ch'on. Can supply lumber, probably little else. East-coast highway and RR about one mile S of river mouth. All unloading must be done at the pier in the outer harbor or by very small harbor craft. Across the land separating the harbor and canal, remining walls have been built. It is roughly triangular, one length beside the canal and the other two meeting at the base of the S training wall.
Hubo-hang (Kōho-kō) (36°40′40″N, 129°27′50″E).	Maximum rise of tide is 0.6′; equinoctial mean high water interval, 3 hrs., 23 min.; tropic mean high water interval, 1 hr., 45 min.	500′ wide between nearest shoal and detached breakwater; minimum depth is 11′; scattered shoals.	No anchorages within the harbor. Outside harbor unprotected.	Harbor surrounded by 3,600′ of open quays with depths up to 6′ alongside. At E breakwater 510′ of open quay, with depths of 7′ alongside.	No data.	Small fishing cove. Abundant supply of fresh water 0.5 mi. N of town. No road or RR connection.
Ch'uksan-dong (36°30′15″N, 129°27′13″E).	Tides rise up to 0.7′; equinoctial tide mean high water interval is 3 hrs., 23 min.; tropic tide, 1 hr., 45 min.	Less than 200′ at narrowest point; depths are 13′ or above at center. Rocks are exposed on both sides of the mouth of the bay.	No protected anchorage except for small craft. Fairly good holding ground.	Two very small piers at head of bay for fishing craft or lighters, and sandy shore where small craft can be beached.	No data.	This harbor and the small relatively unprotected bight immediately S are the only ports of refuge for the area. From the village, one trail leads S to other villages along the coast, and another runs W connecting it with the east-coast highway and RR. Breakwaters of 480′ and 150′ enclose the harbor.
Kanggu-dong (36°21′50″N, 129°25′30″E).	Refer to Hubo-hang (Kōho-kō) above.	330′ wide at narrowest point; depths are irregular from 3½′ to 20′; no defined channel.	2 third-class anchorage berths relatively unprotected by breakwater. Unsafe with NE winds.	1,800′ of open quay on N side with depths of 11½′ to 9′ alongside. 4 piers, averaging 60′ long, with depths of 15′ alongside.	No data.	Small fishing harbor at mouth of small river. The bottom of the harbor within the breakwater is extremely irregular, making it usable only by small boats familiar with port. Few supplies and no coal can be obtained. Connected by road with Yongdok. Storm signal station in village.
Tong-hang (Tō-kō) (34°38′N, 128°16′E). On NE side of Yokchi-do.	Spring rise 8.8′, neap rise 6.5′.	About 2,250′ wide at its entrance.	A good anchorage, free from dangers, with depths of 48′ to 66′. Small vessels, with local knowledge, after entering mid-channel, can obtain good anchorage in a depth of 54′ mud, in the western arm of the harbor, but larger vessels, with local knowledge, should anchor in the wider part of the harbor in a depth of 66′.	Landing can be effected anywhere, but most convenient place is Jifuho, a village on the northern shore of the western arm of the harbor, having a quay length of about 960′ by very shallow water. (Charts show 2 small piers at quay wall at Tonghang-ni (Tōkō-ri) village: one curves, 90′ long; one 60′ long. Total extension of quay wall is approximately 1,020′. Across the W arm of the harbor is a settlement with a quay wall of approximately 600′, alongside shallow water. On the SE side of the harbor another small village has about 780′ of quayage alongside very shallow water.	There is regular steamer communication with other Korean ports.	Harbor is open northeastward but no swell sets in. Small quantities of fowl, eggs, and vegetables can be had. Fish is obtainable from May to October.
Usuyong (34°34′N, 126°19′E). On N side of W entrance to Myongyangdo (Meiyōto).	No data.	No data.	No data.	Landing can be effected at a stone bund which fronts the village and nearly dries.	Steamer communication with Mokp'o (Moppo) (Mokuho).	
Och'ong-do (36°07′N, 125°59′E). Och'ong-do—a wooded island lying about 21 mi. W of Yon-do (En-to). Middle of W coast of Korea.	Springs rise 17.7′, neaps rise 13.7′.	Depth at entrance to bay is from 52′ to 65.6′, gradually decreasing toward the head of bay. Inner bay has no obstructions. There are rocks for about 164′ from both W and E capes at the bay entrance, the one on the E drying 5.9′.	Two second-class anchorages. Depths vary from 35.7′ to 47.8′. Bottom is sandy mud and makes good anchorages. Not protected from winds from SSE to SSW.	There is a wharf 1,246′ long with a road running parallel and depths alongside from 8.8′ to dry at low tide. At the shallow end is a small boat basin in front of the village, further protected by a 164′ breakwater projecting from the shore toward the end of the wharf. Back of this is about 666′ of quayage, also suitable only for small boats and dry at low tide.	Coastal vessels use this well-protected anchorage constantly in summer. Och'ongdo-ri, at the head of the bay, is a fishing village.	As the anchorage is only open on the S and protected by hills on 3 sides, it appears to be suitable as a winter anchorage. However, when strong N or NW winds blow, a whirlwind-like phenomenon occurs, disturbing the anchorage of boats in the harbor, and making it advisable to moor. No water available for supply to ships.

OTHER LANDINGS ON KOREA AND OFF-LYING ISLANDS OF ULLUNG-DO, TSUSHIMA, AND CHEJU-DO

A. Korea Continued

Name and Location	Hydrographic Features	Entrance Channel	Anchorage	Landing Facilities	Commerce	Remarks
Yong'yongdo-myoji (37°39'N, 125°42'E). On SE side of Taeyong'yong-do. N part of W coast of Korea.	Springs rise 22.3', neaps rise 16.7'.	No data.	Depths of harbor range from ½' to 10'. Sand and mud flats, with some islets on them, dry out for about a mi. from village.	No data.	Harbor used from April to June as base of extensive fishing operations. From 1,500 to 2,000 fishing boats enter harbor; value of catch estimated at 500,000 yen yearly.	Because harbor faces the ocean and is unprotected, there have been a number of shipwrecks in the past. A breakwater was constructed from a strand at W side of bay, extending to the NW edge of Tang-do (Tō-tō) (Do-to) (an islet 121' high, lying about ½ mi. E of the village) to provide protection.
Pup'o-ri (37°48'N, 125°37'E). N part of W coast of Korea.	No data.	There are two breakwaters (total length: 1,476') between the peninsula projecting at the E part of harbor and Songbak-to (Shōkaku-tō) (Shokaku Island) at the mouth of the harbor. There is a fairway between them.	Depths in anchorage range from 5½' to 13¾'. The entrance to harbor is shallow and there is a lack of good anchoring ground. There is no protection from E and NE winds. At low tide, because some areas of the harbor dry, it is difficult for ships to enter and leave. A protective wall for the anchorage of fishing boats has been constructed. It has a length of 1,837' and a total enclosed area of approximately 281,800'.	No data.	About 350 fishing boats make this harbor their base during the winter fishing season.	This port and Yonp'yongdo-hang comprise the two most prominent fishing and shelter harbors in the central part of the W coast. Often, when there are SW or SE gales, as many as 2,000 boats in the area take refuge in this harbor.
Kumi-ri (Kyubi-ri) (Kumip'o) (38°02'N, 125°01'E). On the N side of Taedong-man (Daito-wan) about 3.5 mi. E of Yuk-to (Riku-to) (Rikushima). Anchorage is between small cove at Kumi-ri (Kyubi-ri) (Kumip'o) and Kumijon-so (Kumisen-sho), a reef which dries 5 feet.	No data.	There are several dangers in the entrance to Taedong-man (Daitō-wan). However, once these are passed there is deep water (26.9' and over) as far as Kumijon-so (Kumisen-sho).	Anchorage, between the reef and the cove, has depths of 17.7' to 23.9'. The bottom is mud and sand, making a good anchorage ground. Will accommodate 4 or 5 2,000-ton ships.	There are 23 small boats with a loading capacity of 24 tons each. Ships lie offshore and are loaded by means of these boats, which have been filled with silica sand at low tide.	Silica sand found here is exported (for use in glassmaking) at the rate of 35,000 to 45,000 tons a year. There is a branch office of the Kumi-ho Asahi Glass Co. at the waterfront.	Kumi-ri (Kyubi-ri) (Kumip'o) was a summer resort for Europeans. Their colored houses overlooking the cove make it easy to identify.

B. Ullung-do.

To-dong (37°29'N, 130°54'E); E coast of Ullung-do (FIGURE VI-91).	Mean Tidal Range 0.3'. Easterly current in vicinity of Ullung-do has about ¾ knot rate and is much affected by force and direction of wind.	Entrance to SE.	Temporary anchorage sheltered from W and N for small vessels in depths 17 to 19 fathoms over sand and rock 250 to 300 yds. offshore. Bottom descends rapidly to depths over 50 fathoms about 800 yds. offshore.	None; possibly sandy beach where boats are hauled out; has been bulkheaded.	1936: 71 steamships aggregating 57,010 tons and 36 sailing vessels aggregating 2,880 tons entered port.	Largest port and capital of Ullung-do; has a natural harbor for small craft and regular steamer communication. Fresh water plentiful; hospital and small iron works.

C. Tsushima.

Izuhara-minato (34°12'N, 129°18'E) SE coast of S island of Tsushima.	MHWI: 8 hr. 39 m.; Sp Rise: 5.6'; Np Rise: 3.9'; MSL: 3.0'. Flood tide sets to S; Ebb current is to N at 3.4 knot.	Reefs off S side of entrance limit entrance channel to 1,500 feet, but fairway is deep and clear.	Good protection except from E winds. Area obstructed by two submarine cables in NE part. 6 third-class berths in 18 to 60' over sand and mud. Anchorage for small craft in N inlet at bay head, 4 to 18' depths. Small basin formed by 3 breakwaters at head of N inlet.	535' of moorings available at mole in the N inlet, 10' to 24' depths alongside. A mooring buoy just SW of mole for vessels up to 1,500 tons. 6 slips in S inlet for small craft available during high tide.	Regular steamer connection with Korea and Japan.	Izuhara, principal town of Tsushima. Motor road connection with Keichi and Takeshiki. Water hydrants near foot of mole; in 1934 had 1 water boat with capacity of 10 metric tons per hour. One shipyard with 3 small bldg. ways. Three small engine and machine shops.
Nishitomari-wan (Hidakatsu-ura) (34°39'N, 129°29'E) NE side of N island of Tsushima.	MHWI: 7 hr. 36 m.; Sp Rise: 3.6'; Np Rise: 2.3'; MSL: 2.0'. Flood tide sets SSW. Ebb is to N.	Free entrance to outer reaches is 700 yds. wide, 43 to 75' depths; entrance to inner natural harbor is by 200-yd. wide mid-channel with minimum depth of 40'.	Good protected anchorage for 3 small vessels in 40 to 65' depths in inner harbor; temporary anchorage for 2 small vessels in 35 to 65' depths in lower bay.	A 200' quay with depths of 20' alongside, and several small fishing quays located at Nishitomari village on NE end of inner harbor; other small fishing quays at villages elsewhere on bay.	Regular steamer connection with other Tsushima ports, Korea and Japan. In 1932 used by 2,400 steamers aggregating 340,580 tons.	An improved road connects the villages on the bay with Oura on NW coast.
Izumi-ura (34°41'N, 129°29'E) at NE extremity of N island of Tsushima.	For tidal data see Nishitomari-wan (above), 1½ miles S. Ebb sets N at 1 knot; flood sets SW.	Clear and deep. (Inside the bay vessels must pass to the west of Shiko Shima.)	Area limited by reefs on S side of inner harbor and by Shiko Shima. Protection from all winds for 2 third-class berths in depths of 17 to 57' fronting Izumi village, additional berths, 2 third-class and 2 second-class berths in outer bay in depths of 20 to 66', but exposed to NE.	A 500' quay with depths of 17 to 20' alongside and a few quays for fishing boats.	Regular port of call for coasters.	
Shishimi-kō (34°31'N, 129°19'E) An inner inlet of Nita Wan on W side of N Island.	(Sasuna Kō, 8 miles north, has MHWI: 8 hr. 22 m.; Sp. Rise: 4.9'; Np. Rise: 3.3'; MSL: 2.6'.) In offing flood tide sets N but close inshore sets SSW at 1½ knots; ebb tide joins N-going current 2 to 3 miles offshore and attains velocity of 3 knots.	Best approach is from NNW. Narrow entrance is slightly restricted by reef on W and E. Fairway is 75 to 150 yds. wide, with depths of 40 to 95'.	Good protection from all winds but restricted size limits anchorage to small vessels in 43 to 75'.	Several small jetties and quays fringe head of inlet in front of village but can accommodate only small craft.	An open port and busy with small traffic before 1927. A fishing port and timber export center.	Center of the principal lumber producing area in Tsushima.

OTHER LANDINGS ON KOREA AND OFF-LYING ISLANDS OF ULLUNG-DO, TSUSHIMA, AND CHEJU-DO

D. Cheju-do.

Name and Location	Hydrographic Features	Entrance Channel	Anchorages	Landing Facilities	Commerce	Remarks
Cheju (33°31'N, 126°32'E) north central coast of Cheju-do (FIGURE VI-92).	Tidal streams set parallel to coast, 4 miles offshore — west-going streams flow from 3 to 4 hrs. before HW until 2 to 3 hrs. after; east-going streams flow from 2 to 3 hrs. after HW until 3 to 4 hrs. before time of following HW.	500' between NW breakwater and pier to E with depths about 23' at head of breakwater.	10' to 16' depths inside breakwater. Anchorage outside breakwater in less than 10 fathoms with rock, protected only from south.	(Encircled numbers are references to FIGURE VI-92. ① Reclaimed area fronted by bulkhead: 180' exposed to W and 520' to N; no buildings; accessible by road. ② 720' bulkhead: possibly used as quay; small sheds usable from either side. ③ Boat-basin: 160' by 130' with sheds nearby; aerial coverage shows 4 craft here, largest 60'; accessible by road. ④ 375' quay with 2 small boatlandings. ⑤ NW breakwater 2000', possibly still under construction. ⑥ 720' quay or bulkhead with storage sheds. ⑦ River mouth with 570' quay; average river width 90'; accessible by small craft 1000' upstream; largest craft in aerial coverage 60'. ⑧ Boat basin: N side 270', NE 200', SE 270', S 300'; bldgs. for light industry or stores on SE side; largest bldg. 60' by 180'; largest craft present in aerial coverage 90'; adjacent area 720' by 300' possibly used for military barracks or storage; accessible by road. ⑨ Pier formed by reclaimed land: W 360', N 240', E 490'; a few small sheds.	1936: 895 steam vessels with aggregate of 86,530 tons and 370 sailing vessels aggregating 1,940 tons entered port.	Largest port on Cheju-do and capital city. Regular steamer communication with Korea and Japan; connection with arterial highway 22' wide encircling island. Fresh water plentiful. Power plant and hospital.
Hwabuk-ni (Kahoku-ri) (33°31'N, 126°35'E) about 2 miles E of Cheju.	MHWI 10 hr. 22 m. Sp. Rise 7½', Np Rise 5½', MSL 4½'.	Shallow entrance between breakwater on E and rock 110' to W.	Boat basin on SW 400' by 220', protected by breakwaters with 25' entrance, and boat basin on SE 175' by 175', protected by breakwaters with 50' entrance, are probably for fishing vessels. 10-fathom curve about ¼ mile from inner shore of bay.	Boatlanding 90' by 25' for coasters at face of 375' breakwater on east; loading on N side.	No data.	Artificial anchorage for small craft accessible at low water. Fishing village with connection to arterial highway. Possibly small barracks located here. Fresh water available.
Chach'on-ni (33°32'N, 126°38'E) about 5½ miles E of Cheju.	No data.	About 60' between E and W breakwaters; very shallow.	Shallow boat basin 260' by 110', protected on E and N by 405' and 200' breakwaters; usable by 50' craft. Anchorage open to N in 5 to 10 fathoms about 1 mile offshore.	25' face, at N end of E breakwater, possibly usable by coasters; W breakwater usable by fishing boats.	No data.	Artificial fishing harbor and refuge for small craft. Fishing village has regular steamer communication with Korea and Japan; connection with arterial highway encircling island.
Sogwi-p'o (33°14'N, 126°34'E) south-central coast of Cheju-do.	MHWI 9 hr. 20 m. Sp. Rise 8½', Np Rise 6½', Np Range 2¼', MSL 4¼'. Tidal currents ½-¾ of a knot. Flood current continues to flow 2½ to 3 hrs. after HW and ebb for about same after LW. Ebb current has slight inshore set.	325' in 5½ fathoms between island (elev. 48') at entrance and drying reef extending 600' from shore.	At mouth of river in depths 8' to 24' with sand. 710' W breakwater connects island with mainland and offers protection from W; reef affords protection from E. Temporary anchorage open to S in 8 to 16 fathoms with sand and mud E of island.	No data.	1929: 67 steamers with aggregate of 10,446 tons and 144 sailing vessels with aggregate of 1,875 tons entered port; largest was 987 tons.	Fishing harbor and harbor of refuge. Village has regular steamer connection with Korea and Japan; access to arterial highway encircling island. Fresh water available.
Mosulp'o (33°14'N, 126°16'E) SW coast Cheju-do.	No data.	325' entrance to SW in about 5' of water between rocky shoal and foul area off SW protruding reef.	Harbor area fouled; depths 3' to 8' to N and S. Breakwaters form 3 boat basins for very small craft.	No data.	No data.	Small bay protected by reef. Fishing village has regular steamer communication with Korea; connection with arterial highway.
Hallim-ni (33°24'N, 126°15'E) NW coast of Cheju-do. NE of Piyang-do, 32°24'N, 126°14'E, an island ¾ mile offshore.	2½ knot tidal stream in vicinity of Piyang-do. Tidal currents set parallel to coast. Flood current sets northward and ebb southward, turning about 3 hrs. after stand of tide.	850' passage in 8' of water between 1,500' E breakwater and 470' S breakwater. Possibly a 60' passage for small craft between E breakwater and rocky ledge to N.	Anchorage for small craft inside breakwater in 6' to 9' depths over sand. Areas roughly to S of Piyang-do, open to NW, and between Piyang-do and coast of Cheju-do, open to N, contain 7 first-, 9 second- and 19 third-class temporary anchorage berths with sand and rock. Small vessels may anchor close in to Piyang-do.	1,600' of reclaimed area on the E shore is bulkheaded; 1,640' quay and 1,150' bulkhead on SW and N sides of reclaimed area; all for lighters.	No data.	Artificial harbor for small craft. Fishing village has regular steamer communication with Korea and Japan; connection with arterial highway encircling island.

TABLE VI - 22

ANCHORAGES OF KOREA, AND OFF-LYING ISLANDS OF TSUSHIMA AND CHEJU-DO (SAISHU)

NOTE: Explanation of letters used to describe fairways, and definitions of anchorage berth classifications will be found in Topic 64, text. Locations of the anchorages listed in this table are indicated by arrows on FIGURE VI - 93, which also locates all ports and landings. The numbers accompanying the arrows refer to the numbers assigned to the anchorages in the following table.)

A. Korea.

NAME AND LOCATION	*Approaches* TIDES - CURRENTS	FAIRWAY	ANCHORAGE HOLDING GROUND	DEPTHS IN FEET (MLW)	SIZE	SHELTER	*Capacity (No. of Anchorage Berths)* 1ST CLASS	2ND CLASS	3RD CLASS	REMARKS
1. Chosan-man (Zōzan-wan) 42°15'N, 130°30'E.	1' rise—negligible current.	A	Good	36-90	Large	Fair but exposed southward.	35	30	33	Anchorages are in arms and inlets of Chosan-man (Zōzan-wan). Entire bay is open southward. Port of Unggi with landing facilities for large vessels is in northwest corner. Thin film of ice Dec.—Jan.
2. Najin-man 42°10'N, 130°15'E.	1' rise—negligible current.	Southern entrance B. Eastern entrance D.	Fair	30-70	Large	Best on NE coast. Exposed northward.	76	21	27	These berths include subsidiary bays adjoining immediately southwestward of Najin-man. Port of Najin with docking facilities for large vessels is at head of Najin-man. Underwater obstacles make approach to port dangerous. Some ice Dec.—Jan.
3. Ijin-man (Rishin-wan) 42°05'N, 130°07'E.	1' rise—negligible current.	A	Good	30-65		Medium	16	....	....	Detached reefs 800 yds. off NE shore.
4. Sajin-man 42°00'N, 130°00'E.	1' rise—negligible current.	A	Good	30-70	Small	Good but exposed southward.	10	....	....	Open southward and hence dangerous in summer.
5. Yongjo-man (Ryōsho-wan) 41°59'N, 129°59'E.	1' rise—negligible current.	C	Good	30-60	Small	Good.	2	6	....	Shoals off southwestern shore of bay.
6. Ssangp'o-man (Sōho-wan) 41°57'N, 129°59'E.	1' rise—negligible current.	A	Fair	25-50	Small	Good. Well protected from south.	4	. .	....	Better protected anchorage than Sajin-man and Yongjo-man in Aug. and Sept., when prevailing wind is from S.
7. Kidong-man 41°54'N, 129°54'E.	No data.	A	No data.	25-60	Medium	Fair. Exposed southeastward.	....	....	....	
8. Ch'ongjin-hang 41°46'N, 129°49'E.	11' rise. Negligible currents.	A	Good	30-60	Large	Fair. Exposed southward.	35	7	8	Port of Ch'ongjin with landing facilities for large vessels in northeast corner of bay. Occasional winter ice.
9. Tokchin-myoji (Dokushin-byōchi, Tokchin Anchorage) 41°40'N, 129°42'E.	No data.	....	No data	30-50		Completely exposed.	.	....	....	Roadstead anchorage.
10. Odaejin 41°27'N, 129°46'E.	11' rise. Negligible currents.	B	Good	35-65	Small	Fair. Exposed northward.	....	....	8	Small port of Odaejin in SE corner of bay.
11. Iam-man (Rigan-wan, Peijin-man) 41°19'N, 129°46'E.	Tides: no data. 1-2 knots S-going current 2-10 mi. offshore.	B	Fair	35-125	Small	Fair. Exposed eastward.	1	1	....	Subject to heavy swell; not a safe anchorage.
12. Tajin-man (Tashin-wan, Taejin-man) 41°16'N, 129°45'E.	Tides: no data.	D	Good	30-50	Small	Fair. Exposed eastward.	....	....	2	Bay divided into 2 sections; southern section affords better anchorage.
13. Taeryanghwa-man (Dairyōka-wan) 41°12'N, 129°43'E.	1' rise. 1-2 knots S-going current 2-10 mi. offshore.	B	Good	30-45	Small	Good. Exposed eastward.	1	....	2	Except during E winds, best anchorage between Orang-dan (Gyorō-tan) and Busui Tan. Jetty at village.
14. Hwangjin-man (Kōshin-wan) 41°05'N, 129°43'E.	1' rise. 1-2 knots S-going current 2-10 mi. offshore.	B	Good	30-60	Small	Fair. Exposed northeastward.	1	. .	.	
15. P'ohang-man (Hōkō-wan) 40°59'N, 129°43'E.	1' rise. 1-2 knots S-going current 2-10 mi. offshore.	D	Poor	30-60	Small	Fair. Exposed eastward.	. .	....	3	
16. Kalma-p'o (Katsuma-ho, Karuma Ho) 40°50'N, 129°42'E.	1' rise—negligible current.	A	Good	30-100	Small	Good.	....		6	One of few good havens in this area.
17. Whanggaldong-myoji (Kōgandō-byōchi, Hagamu Anchorage) 40°49'N, 129°34'E.	1' rise—negligible current.	C	Good	25-48			....	....	....	Roadstead anchorage partially protected from N.
18. Yangdo-myoji (Yōtō-byōchi, Yan To) 40°46'N, 129°32'E. Islands 2 mi. southward of Chongho (Seiko, Chon Ho).	1' rise—negligible current.	....	Fair	42-72		Fair. Protected from S.	....	....	....	Roadstead anchorage just northward of 3 islands. Vessels can anchor here or in Whanggaldong-myoji (Kōgandō-byōchi) according to direction of wind.
19. Immyong-hae (Rinmei-kai, Immyon Sea) 40°41'N, 129°15'E.	1' rise—negligible current.	A	Good	20-102	Large	Good.	Unlimited anchorage.			Excessive depths and southward exposure make N portion of bay suitable for temporary anchorage only. Best anchorage at port of Songjin on W shore of bay. N harbor here contains 4 first-, 3 second-, 3 third-class anchorage berths. Alongside berths for large vessels at the port.
20. Yongdae-myoji (Ryūdai-byōchi) 40°29'N, 129°03'E.	1' rise—negligible current.	B	Good	21-30	Small	Fair. Exposed to S and SW.	....	....	6	

TABLE VI - 22 *Continued*

Name and Location	Approaches: Tides · Currents	Fairway	Holding Ground	Depths in Feet (MLW)	Size	Shelter	Anchorage Capacity (*No. of Anchorage Berths*): 1st Class	2nd Class	3rd Class	Remarks
21. Yongom-ni (Ryūgan-ri) 40°23'N, 128°55'E.	1' rise—negligible current.	A			Small					Photographic coverage is only source of information. Harbor consists of 2 small basins, probably built to serve industries. Usable by small coasters.
22. Iwon-pakchi (Rigen-hakuchi) 40°17'N, 128°40'E.	1' rise—negligible current.	A	Good	24-48	Large	Fair. Exposed eastward.	Unlimited Anchorage			Heavy swell during easterly winds. 2 landing piers at village on shallow bight near northern head of bay.
23. Cha'ho (Cha'ho-hang, Shako-kō) 40°12'N, 128°38'E.	1' rise—negligible current.	A	Good	23-66	Small	Good but exposed to S	1	1	3	Iron pier at village. Important ore-shipping point.
24. Sinch'ang-hang (Shinshō-kō) 40°08'N, 128°29'E.	1' rise—negligible current.	A	Good	18-60	Small	Poor	....	....	8	Heavy swell except during northerly winds.
25. Yangbwa-man (Yōka-wan) 40°04'N, 128°15'E.	1' rise—negligible current.	A	Good	21-72	Large	Fair. Exposed southward.	Unlimited Anchorage.			Small boats at eastern of 2 villages on NE shore of bay.
26. Sinp'o-hang (Shinho-kō) includes Mayang-do (Bayō-tō) 40°01'N, 128°12'E.	1' rise—negligible current.	A—(E entrance) D—(W entrance)	Good	20-66	Large	Fair	38	22	23	Best anchorage is in small bays along mainland and N shore of island facing mainland. Port of Sinp'o with landing facilities for small coasters lies at head of Sinp'o-hang.
27. Songyong-man (Shōrei-wan) 40°02'N, 128°01'E.	1' rise—negligible current.	A	Fair	24-42	Small	Fair but exposed south-eastward.	Insufficient chart coverage.			Small boat landings at village of Chonjin (Zenshin, Jonjin).
28. T'oejo-man (Taichō-wan, Toe Cho Kei) 39°53'N, 127°47'E.	1' rise—negligible current.	B	Good	30-45	Small	Good but exposed south-eastward.	1	3	. .	Good small haven.
29. Hambung-man (Kankō-wan, Hamheung-man) 39°44'N, 127°36'E.	1' rise—negligible current.	A	Good	22-60	Large	Fair during offshore winds.	Unlimited Anchorage.			Best anchorage is in NW corner of bay, off important port of Hungnam (Kōnan), which has landing facilities for large vessels.
30. Yonghung-man (Eikō-wan) 39°25'N, 127°26'E.	1½' rise. Swift current off Kalma-gak, at S entrance to Yonghung-man.	A	Good	30-60	Large	Good, although N and NE winds cause heavy swell.	Unlimited Anchorage.			Approach is complicated by islets in entrance. Port of Wonsan in Wonsan-hang in S portion of bay. Landing facilities for large vessels.
31. Kojo-p'o (Kotei-ho) 38°58'N, 127°53'E.	1' rise—negligible current.	A	Good	20-40	Small	Good.	....		16	Breakwater and 3 small piers at Kojo, on SE shore of bay.
32. Changjon-hang (Chōsen-kō) 38°44'N, 128°12'E.	1' rise.	B	Good	18-42	Small	Good.	....	....	39	Numerous small fishing piers and 1 larger pier for 200-ton vessels at Changjon on W shore of bay. Strong local winds in April, May, Nov., and Dec., generally beginning as S to SW winds, later veering to N and E.
33. Pongsu-hang (Hosui-kō) 38°39'N, 128°21'E.	1' rise.	. .	Fair	10-40			....	. .	.	Roadstead anchorage.
34. Kojin-pakchi (Kyoshin-hakuchi) 38°26'N, 128°27'E.	1' rise.	....	Good	30			....	. .		Roadstead anchorage close southwestward of Kojin-dan (Kyoshin-tan).
35. Sokch'o-hang (Sokusō-kō) 38°12'N, 128°36'E.	1' rise.	.	Poor	20-50			....	....	....	Roadstead anchorage. Small breakwater SW of village close southwestward of Pisonjang (Hisenjō, Pisen Chang) point.
36. Tang'o-hang (Daiho-kō, Taiho Kō) 38°10'N, 128°37'E.	1' rise.	A	Poor	20-50	Small	Poor.	2	....	....	Open bight, with village and piers on W shore.
37. Chumunjin-hang (Chūmonshin-kō) 37°53'N, 128°50'E.	1' rise.	....	Poor	27						Roadstead anchorage. Shallow, breakwater-enclosed basin with 3 small piers close southwestward of Chumunjin-tan (Chūmonshin-tan, Chumonjin Dan).
38. Chongdongsin-dan (Seitōshin-tan) 37°39'N, 129°03'E.	1' rise.	....	Good	25-50						Roadstead anchorage 1¾ mi. southward of Chongdongsin-dan (Seitō-shin-tan).
39. Mukho-hang (Bokuko-kō, Bokko Ho) 37°33'N, 129°07'E.	1' rise.	B	Good	30	Small	Fair.	....	.	3	Fishing port of Mukhojin-ni with quays and breakwaters on NE shore of bight. Roadstead anchorage outside harbor limit for larger vessels.
40. Chongyu-hang (Teiu-kō) 37°25'N, 129°11'E.	¾' rise.	B	Good	3-15			....		2	Small craft haven only. 3 jetties from small fishing villages at mouth of Osip-ch'on (Gojō-sen).
41. Sail-tan (Shajitsu-tan) 37°19'N, 129°17'E.	1' rise.	. .	Good	30-45			....	....	....	Roadstead anchorage about 1¼ mi. northwestward of Sail-tan (Shajitsu-tan).
42. Sŏkŏ Matsu 37°17'N, 129°19'E.	1' rise.	.	Poor	9-25			....	....	....	Roadstead anchorage for small vessels only in small bay westward of Sŏkŏ Matsu.
43. Imun-mal (Rinin-matsu) 37°13'N, 129°21'E.	1' rise.	....	Poor	42-65			....	....	....	Roadstead anchorage close southwestward of Imun-mal (Rinin-matsu), protected from all but S and SE winds.
44. Chukpyon-man (Chikuhen-wan) 37°03'N, 129°26'E.	1' rise.	B	Poor	15-30	Small	Poor except from NW winds.		....	9	Anchorage for small vessels only. Constantly subject to heavy swell. Small pier at village on NW shore of bay.

TABLE VI - 22 *Continued*
ANCHORAGE

Name and Location	Approaches: Tides · Currents	Fairway	Holding Ground	Depths in Feet (MLW)	Size	Shelter	Capacity (No. of Anchorage Berths): 1st Class	2nd Class	3rd Class	Remarks
45. Hubo-hang (Kōho-kō) 36°40'N, 129°28'E.	¾′ rise.	A	Fair	12-30						Roadstead anchorage off small port equipped with quays and breakwaters.
46. Ch'uksan-p'o (Chikusan-ho) 36°30'N, 129°27'E.	⅗′ rise.	B	Fair	13-42	Small	Fair.	1	....	4	Protected anchorage for small craft in breakwater-enclosed area. Fairly protected anchorage for larger vessels in bight south of harbor.
47. Kanggu-hang (Kōkō-kō) 36°22'N, 129°23'E.	¾′ rise.	B	Fair	3.5-20	Small	Poor.		....	2	River-mouth fishing harbor equipped with breakwater and quays.
48. Yongil-man (Eijitsu-wan) 36°03'N, 129°27'E.	¼′ rise.	A	Good	20-96	Large	Fair. Exposed northeastward.	5	18	35	Anchorage area is in N portion of bay; unsafe during N and NE winds. Fishing port of P'ohang-dong (Hokō-dō) lies on W shore of bay. Landing facilities for fishing boats.
49. Kuryongp'o-hang (Kyūryūho-kō) 35°59'N, 129°30'E.	No data.	B	Poor	17-33	Small	Good.	....	....	3	Roadstead anchorage for larger vessels outside breakwater area. Fishing port equipped with quays and breakwater lies on N side of bay.
50. Kamp'o-hang (Kanho-ho) (Kanho) 35°48'N, 129°31'E.	No data.	B	Fair	20-27	Small	Fair. Open south and eastward.	....	....	4	Roadstead anchorage for larger vessels outside breakwater area. Fishing port with bulkheaded shoreline and breakwaters lies at head of bay.
51. Pungosin-hang (Hōgyoshin-kō) 35°29'N, 129°26'E. Just eastward of entrance to Ulsan-man.	No data.	B	Good	12-37	Small	Good.	....	....	3	Roadstead anchorage for larger vessels outside breakwater area. Piers, breakwater, and bulkheaded shore at village on SW shore of cove.
52. Ulsan-man (Urusan-wan) 35°30'N, 129°24'E.	2¾′ rise.	A	Good	20-54	Large	Good but exposed southeastward.	15	11	40	Main anchorage is in harbor, a long narrow inlet open southward. Additional anchorage space outside harbor and in small bight close southwestward. Town of Ulsan lies up river; loading and unloading is carried on at Changsaengp'o-ri, a small port with bulkheaded shoreline.
53. Pusan 35°06'N, 129°02'E.	4′ rise. Tidal currents of 1 to 5½ knots.	A	Good	25-50	Large	Good.	14	20	29	Port of Pusan with extensive landing facilities lies on western shore of bay.
54. Masan-hang (Mazan-kō, Masan-po) 35°12'N, 128°33'E. Lies on long inlet northward of Chinhae-man.	6′ rise.	B	Good	15-70	Large	Good.	18	16	41	Anchorage space includes area northward of the Gate. Port of Masan lies on W shore of inlet. Protected anchorage in 24-foot depths may also be had in Haengam-man, on N side of Pu-lo channel, about 6 mi. southeastward of Masan.
55. Chinhae-man 35°00'N, 128°33'E.		A	Good	70	Large	Good.	Unlimited Anchorage.			Fleet anchorage for large naval base of Chinhae (CHAPTER XIII).
56. Chisa-p'o 34°50'N, 128°44'E. On SE coast of Koje-do.	6½′ rise. Tidal rips outside the bay.	B	Good	35-66	Small	Good.	....	....	26	Piers and bulkheaded shore at northern portion of bay, fronting village of Churimp'o (Shurimpo, Satirimpo). Landing facilities for small craft.
57. Tojang-p'o (Tōzō-ho) 34°46'N, 128°41'E. On SE coast of Koje-do.	7½′ rise. Strong tidal rips.	A	Good	30-50	Large	Fair. Exposed to SE.	16	6	....	Anchorages lie in Kujora-p'o (Kyūjora-ho), Mangch'i-po (Bōji-ho, Manji Ho), and Mang-p'o (Mō-ho), 3 smaller bights within Tajang-po (Tōzo-ho).
58. Tadae-p'o (Tadai-ho) 34°45'N, 128°39'E. On SE corner of Koje-do.	7½′ rise. Strong tidal rips.	A	Good	30-50	Small	Fair. Exposed to SE.	12	....	....	Not safe during SE winds.
59. Koje-man (Kyosai-wan, Chikurin Ho, Cargodo Gulf) 34°49'N, 128°35'E. On SW side of Koje-do.	9½′ rise.	B	Good	25	Large	Good.	....	....	30	
60. T'ongyong (Tōei) 34°51'N, 128°27'E. Narrow gulf of T'ongyong-haenan (Tōei-kaiwan) westward of Kongjin-do (Kyūshu-to) and Hansan-do (Kanzan-to).	9¼′ rise.	A (S entrance)	Good	25-30	Medium	Fair. Exposed southward.	11	15	7	Many small indentations on both sides of gulf afford anchorage for small vessels. Fishing port of T'ongyong is on NW shore of gulf, and offers sheltered but confined anchorage to medium-sized and small vessels.
61. Charan-man (Shiran-wan) 34°55'N, 128°14'E. About 10 miles westward of Chinhae-man.	10′ rise.	C	Good	25	Large	Good.	....	20	8	
62. Saryang-haehyop (Daryō-kaikyō, Saaryan Kaikyo) 34°49'N, 128°12'E.	9½′ rise.	B	Good	30-40	Small	Fair.		....	10	Anchorage for small vessels in SW and NE portions of strait. Small villages on shore. No landing facilities.
63. Tong-hang (Tō-kō) 34°38'N, 128°16'E. On N shore of Yokchi-do.	9¾′ rise.	B	Good	30-65	Small	Good.	....	....	8	Village of Jifuho, with landing facilities for small vessels, on NW shore of bay. Other villages with small craft landings nearby.

TABLE VI - 22 *Continued*

Name and Location	Approaches: Tides · Currents	Fairway	Holding Ground	Depths in Feet (MLW)	Size	Shelter	Capacity (No. of Anchorage Berths): 1st Class	2nd Class	3rd Class	Remarks
64. Samch'onp'o (Sanzenho) 34°55'N, 128°04'E. Just eastward of Kangjin-hae (Kōshin-kai, Chinju Wan).	9¾′ rise.	B	Fair	10-60	Small	Good.	1	1	15	Eastern channel is winding and dotted with rocks and islets. Anchorage is in roadstead fronting the port and in easternmost of the 3 bays of the port. Some landing facilities at port for small craft.
65. Mijo-man (Mijo-wan) 34°44'N, 128°03'E. On SE coast of Namhae-do (Nankai-tō).	10¼′ rise.	A	Good	40-50	Small	Fair. Exposed eastward.	9	....	....	
66. Kangjin-hae (Kōshin-kai, Chinju Wan) 34°55'N, 127°51'E. Northward of Namhae-do (Nankai-tō).	10¾′ rise—E entrance. 12¼′ rise—W entrance. Strong tidal streams.	D	Good	10-40	Large	Good.	20	....	....	Very shallow for the most part, with first-class anchorage berths just inside NE and NW entrances. Small vessels call at Chin'gyo, village in extreme NW corner of bay. This area of the bay dries at low water, but vessels come in on spring tide.
67. Aenggang-man (Ōkō-wan, Yenkagu Wan) 34°45'N, 127°56'E. On S shore of Namhae-do (Nankai-tō).	No data.	A	Good	30-50	Medium	Good but exposed southward.	16	....	....	Subect to heavy swell during S winds.
68. Yosu (Reisui) 34°44'N, 127°45'E. On W shore of Yosu-barman (Reisui-kaiwan).	10¾′ rise. Tidal currents of 2 to 4 knots.	A	Good	15-45	Small	Good, although occasionally subject to swells from S.	1	5	11	Best anchorage is in north harbor, in breakwater-enclosed area. Small vessels may anchor in south harbor. Unlimited roadstead anchorage exposed southward in channel outside breakwaters. Port of Yosu undergoing extensive harbor construction.
69. Yoja-man (Joji-wan) 34°43'N, 127°30'E. Westward of Yosu-hantō (Peninsula).	13½′ rise. Tidal streams of of 3 knots in entrance.	B	Good	30-70	Large	Good	30	10	....	Approaches are broad and clear, but just within entrance are many islets between which are several channels. Northern portion of bay is shallow and foul.
70. Tongyang-man (Tokuryō-wan, Tokuryō Wan) 34°35'N, 127°05'E.	Approx. 12′ rise. Strong tidal streams in entrance.	A	Good	25-60	Large	Good.	Unlimited Anchorage.			Approaches are complicated by numerous islands and islets.
71. Tonae-hae (Tōnai-kai) 34°03'N, 127°19'E.	11½′ rise.	B—(SE entrance only)	Good	50	Medium	Good, although gales from E and SE cause heavy swell.	10	....	....	Settlements along all shores of bay. Small jetties and quays.
72. Soan-hang (Shoan-kō) 34°10'N, 126°35'E. In Soan-kundo (Shoan-guntō), between Soan-do (Shoan-tō) and Pogil-to (Hokitsu-tō, Pogiri Tō).	10¾′ rise. Strong tidal streams.	A	Poor	50-85	Large	Poor. Exposed southward and subject to violent squalls.	....	16	10	Anchorage for large vessels in W central portion of bay. Small vessels can anchor in channel between Pogil-to (Hokitsu-tō) and Soan-do (Shoan-tō), in small bight on SE shore of Soan-do (Shoan-tō), and in Ch'onggyon-p'o (Seihen-ho Chemben Kō), on E side of Soan-do (Shoan-tō).
73. Taebukkan-do (Dai-Kokuzan-tō, Daikokuzan Tō) 34°40'N, 125°25'E.	11½′ rise. Strong currents.	B	Fair	18-60	Small	Fair.	....	11	5	A number of small bights on N, E, and W sides of island afford fairly sheltered anchorage, depending on direction of wind. Chin-ni (Chin-ri), at head of bight on NE shore of island is principal settlement.
74. Mokp'o 34°47'N, 126°23'E.	13½′ rise. Strong and erratic tidal streams.	D	Good	30-80	Small	Good.	....	19	....	Entrance is winding and complicated by many islands and islets. Port of Mokp'o lies on S shore of Muan-pando (peninsula).
75. Hamp'yong-man (Kampei-wan, Kanhei Wan) 35°07'N, 126°23'E.	20¾′ rise. Tidal currents of 3 knots.	D	Good	30-50	Medium	Fair. Exposed westward.	....	15	5	Approaches are difficult. Shoals and mud flats make all but N central portion of bay useless as anchorage.
76. Anma-do 35°21'N, 126°00'E. Island group about 15 mi. WNW of mouth of Hamp'yong-man (Kampei-wan, Kanhei Wan).	18½′ rise. Strong tidal currents.	A	Good	30	Small	Fair. Exposed northwest through southwestward.	....	4	1	Aside from main anchorage space, there is small craft anchorage in 2 bights on W shore of Anma-do.
77. Kogunsan-kundo (Kogunzan-guntō) 35°47'N, 126°25'E. In channel between N and S island groups. Islands lie about 10 mi. offshore.	22′ rise. Tidal currents of 1 to 3 knots.	A—(W entrance) D—(E entrance)	Good	50	Small	Good. Exposed only to W.	....	....	20	
78. Kunsan-hang (Gunzan-kō, Kunsan Kō) 35°59'N, 126°42'E. On S bank of Kum-gang, about 12 mi. upstream from mouth of river.	20′ rise. Strong tidal currents.	D	Good	9-28	Small	Good.		....	15	Approach to port is shallow and tortuous, ships drawing over 7 feet being unable to enter except at high tide. Silting at the river mouth and the great tidal range make navigation difficult. Anchorage berths include those at Changhang-ni (Chōkō-ri) the new port across the river from Kunsan. 4 of the 15 anchorage berths lie outside the harbor limit to the NW. Landing facilities for small vessels at both Kunsan and Changhang-ni.

TABLE VI - 22 *Continued*
ANCHORAGE

Name and Location	*Approaches* Tides - Currents	Fairway	Holding Ground	Depths in Feet (MLW)	Size	Shelter	*Capacity (No. of Anchorage Berths)* 1st Class	2nd Class	3rd Class	Remarks
79. Yon-do (En-tō, Yontō) 36°04'N, 126°28'E. Island about 15 mi. west-northwestward of Kunsan.	No data.	—		30-35			—	—	—	Roadstead anchorage just northeastward of island.
80. Och'ongdo-myoji (Oseitō-byōchi) 36°07'N, 125°59'E. Island lying about 35 mi. WNW of Kunsan.	19¾′ rise.	B	Good	20-65	Small	Good, but exposed southward.	—	—	5	Breakwater and jetties front fishing village on W shore.
81. Oeyeodo-myoji (Gaientō-byōchi) 36°14'N, 126°03'E. Just northeastward of Och'ong-do.	20′ rise.	A—(N entrance)	Fair	35-50	Small	Fair. Exposed W and northwestward.	7	—	7	Anchorage is area enclosed by 4 small islands. Best spot is in N portion.
82. Ch'onsu-mun (Sensui-wan, Sajan Kaye) 36°27'N, 126°28'E.	24¾′ rise at entrance. 26¾′ rise at head of bay. Strong tidal currents.	C	Good	35-70	Large	Good.	Unlimited anchorage where bay is unencumbered by islets and shoals.			Tortuous entrance. Principal anchorage is in S central portion of bay. Smaller anchorage area just southward of entrance, to E of Wonsan-do. Inner portion of bay encumbered by islets and shoals.
83. Asan-myoji (Gazan-byōchi, Garan Byochi) 37°00'N, 126°44'E.	29¼′ rise. Strong tidal currents.	D	Poor	35-60	Medium	Good.	20	—	—	Tortuous entrance. Best anchorage is near head of bay about 18 mi. inside P'ung-do (Hō-tō), an island off the entrance. Although bay is large, anchorage area is only about 3 miles long and about 1 mi. wide.
84. Inch'on (Jinsen) 37°28'N, 126°44'E. At mouth of Yom-ha (river).	28½′ rise. Tidal currents of 2¾ to 3½ knots.	A	Good	25-80	Medium	Good.	16	6	7	Approach is through 50-mile long winding channel from S. Unlimited anchorage is possible in channel below harbor, depths 30-50'. Landing facilities for good-sized vessels at the port.
85. Haeju-man (Kaishū-wan) 38°00'N, 125°42'E.	24′ rise. Very strong tidal currents.	D	Poor	20-30	Small	Fair. Exposed southward.	—	—	27	No really good anchorage in Haeju-man, as bottom is poor, tidal currents strong, and usable space restricted by shoals and mudflats. Port of Yongdangp'o is at head of bay; quays and landing facilities for vessels drawing up to 19'.
86. Sunwido-myoji (Junitō-byōchi, Juni Tō Byochi) 37°46'N, 125°19'E. Between Sunwi-do (Juni-tō) and peninsula just southeastward.	18½′ rise. Strong tidal streams.	D	Good	50-90	Medium	Fair. Exposed to S and SW winds.	12	—	—	Very narrow anchorage.
87. Kangyong-gang (Kōrei-kō) 37°47'N, 125°21'E. Inlet just northeastward of Sunwido-myoji (Junitō-byōchi).	18½′ rise. Strong tidal streams.	D	Good	40-60	Medium	Good.	12	—	—	Very narrow anchorage.
88. Taedong-man (Daitō-wan) 38°00'N, 125°00'E.	14′ rise. Strong tidal streams off entrance; weaker within bay.	C	Good	18-35	Large	Fair. Somewhat exposed southwestward.	—	35	—	Best anchorage is in center of bay, off Kumijon-so (Kumisen-sho, Kumijon Yo), and off Kumi-ri (Kyūhi-ri, Kumip'o), a small bight on N side of bay. Kumi-ri (Kyūhi-ri, Kumip'o) is the site of important silica deposits.
89. Chinnamp'o-hang (Chinnampo-kō) 38°43'N, 125°24'E. Situated 20 mi. up Taedong-gang (river).	18′ rise. Strong tidal streams.	A	Good	40-90	Large	Good.	40	—	—	From 22 Jan. to 15 Feb. drift ice frequently isolates harbor from sea. Landing facilities for ocean-going vessels at the port.
90. Kyomip'o (Kenjiho) 38°45'N, 125°38'E. 16 mi. beyond Chinnamp'o up Taedong-gang (river).	21½′ rise. Strong currents.	D	Fair		Medium	Good.	4	3	3	Approach is tortuous and narrow. Strong currents in river. Vessels anchor in river off city, no docking facilities for large vessels. Taedong-gang (river) above Chinnamp'o closed by ice from 1 Jan. to 15 March.
91. Sonch'on-mun (Sensen-wan) 39°37'N, 124°50'E.	22⅜′ rise. Very strong tidal currents.	D	Good	20-50	Large	Fair. Exposed southward.	—	25	—	Shoals and mudflats make local knowledge essential. Although bay is large, anchorage area is restricted to 3 places: (1) westward of Ta'n-do (Tan-tō), (2) between Ka-do (Ka-tō) (Kaa To) and T'an-do (Tan-tō), and (3) upper central portion of bay.
92. Ch'olsan-myoji (Tetsuzan-byōchi, Chorusan Byochi) 39°42'N, 124°29'E. Between Chorusan-pando (peninsula) and Pansong-yoho (Banjō-retto) (Banjo Islands), in Yalu River estuary.	23′ rise.	D	Good	25-50	Small	Poor.	—	—	20	Roadstead anchorage in narrow channel between mud flats. Approach requires local knowledge.
93. Dasado (Taedasa-do, Tashi-tō) 39°48'N, 124°25'E. In E entrance channel of Yalu River.	21′ rise. Strong tidal streams	D	Good	15-33	Small	Poor.	1	—	20	Dasado (Taedasa-do, Tashi-tō) is being made an important port, and because of the harbor construction work, the old anchorage space is much reduced. At present only one anchorage berth is near Taedasa-do (island). Several concrete wharves able to dock 6,000-ton vessels have already been completed. Ice closes Yalu River to navigation from late October to early May. Approach requires local knowledge.

TABLE VI - 22 *Continued*

Name and Location	Approaches: Tides · Currents	Approaches: Fairway	Holding Ground	Depths in Feet (MLW)	Anchorage: Size	Anchorage: Shelter	Capacity (No. of Anchorage Berths): 1st Class	2nd Class	3rd Class	Remarks
94. Yongamp'o 39°37'N, 124°20'E. On E bank of Yalu River.	15¼' rise. Strong currents.	D	Good	13			....	....	....	Strong currents make this roadstead anchorage in the river a poor one. Available only to vessels of less than 2,000 tons; larger vessels must work their cargo in the Dasado (Taedasa-do, Tashi-tō) anchorage. Ice closes river Oct. to May.
95. San-tao-lang-t'ou (Santaoranto, Santaolangkow) 40°00'N, 124°20'E. On W bank of Yalu River, above Yongamp'o.	18' rise. Strong currents.	D	Good	11-15			....	....	....	Auxiliary roadstead anchorage for Antung. Cargo worked here taken to and from An-tung by lighters. Some small landing facilities.
96. Sinuiju (Shingishū) 40°06'N, 124°24'E. —and— An-tung 40°09'N, 124°23'E.	10' rise. Strong currents.	D	Good	3-15			....	....	....	Roadstead anchorage in river between the 2 towns. Most landing facilities are concentrated on An-tung side.
					B. Tsushima.					
97. Wani-ura 34°42'N, 129°26'E. N coast of Tsushima.	4¼' rise. Tidal streams of 3-4 knots.	B	Poor	36-140	Small	Poor. Entirely exposed northward.	3	....	4	Anchorage is untenable with weather from N; during NW winds vessels may anchor close southward of Uni-shima, in the entrance of bay. Village of Waniura lies at head of inlet on SE shore of bay. Small quays for fishing craft.
98. Toyo-ura. 34°42'N, 129°28'E.	4½' rise. Tidal streams of 3-4 knots.	D	Good	25-55	Small	Poor. Entirely exposed northward.	.	....	2	Anchorage is untenable during weather from N. Village of Toyo at head of bay. No landing facilities except for fishing craft.
99. Izumi-ura. 34°41'N, 129°29'E. Extreme NE coast of Tsushima.	3½' rise.	B	Good	36-50	Small	Good, although portions of bay exposed northeastward.		1	3	Best anchorage is at head of bay, in shelter of Shiko-shima. Village of Izumi is at head of bay. Landing facilities for vessels drawing up to 17'.
100. Miuda-ura 34°40'N, 129°30'E.	3½' rise.	B	Fair	22-65	Small	Poor. Exposed northeastward.	.	.	4	Suitable only as haven. Reefs fringe shores of bay, and head is foul. No landing facilities.
101. Nishitomari-wan 34°39'N, 129°29'E.	3½' rise.	B	Good	40-60	Small	Good.	....	....	7	Outer portion of anchorage exposed eastward, but inner portion well protected. Several villages on shores of bay, most important is Hitakatsu (Hidakatsu), at head of bay, which has a 200-foot quay with depths of 20 feet alongside.
102. Shūshi-wan 34°36'N, 129°28'E.	Approx. 3½' rise.	B	Good	40-110	Small	Good, although outer portion exposed eastward.	. .	3	5	Approach and channels through upper reaches are very narrow and require caution. Shūshi village at head of northern arm. Quays for fishing craft.
103. Kin-wan 34°33'N, 129°28'E.	Approx. 3½' rise.	B	Good	16-45	Small	Fair. Exposed eastward.	1	....	2	No landing facilities except for fishing craft.
104. Saga-wan 34°27'N, 129°23'E.	Approx. 4' rise.	B	Good	20-50	Small	Poor. Exposed eastward.	....	.	3	Approach must be made from northeast, because reefs obstruct entrance elsewhere. Untenable during east winds. Reefs fringe shores. Village of Saga at head of bay has small quays and jetties for fishing craft.
105. Yokoura-wan 34°25'N, 129°23'E.	Approx. 4' rise.	B	Good	40-120	Small	Fair. Exposed northeastward.	1	....	2	Anchorage is in southern arm, which is more exposed. Northern arm is too constricted for any but small craft, although it is better protected. Village of Kushi with quays for fishing craft is at head of northern arm.
106. Miura-wan 34°19'N, 129°53'E.	4¼' rise.	B	Good	35-125	Small	Good. Exposed eastward.	10	....	5	Anchorage includes 2 long arms in inner portion of bay. At head of southern arm is an artificial channel leading to Aso-wan on west coast. No landing facilities except for small fishing craft.
107. Kechi-wan 34°15'N, 129°20'E.	4½' rise.	A	Good	36-125	Small	Poor. Exposed south and eastward.	10		9	Anchorage is in northern portion of bay, and is temporary only, as heavy seas come in with S and E winds. Narrow channel connects N end of bay with Aso-wan on W coast. No landing facilities.
108. Azu-kō 34°13'N, 129°18'E. Just northward of Izuhara.	4½' rise.	B	Good	36-65	Small	Good.	....	2	1	Jetties and quays for fishing craft at villages of Magari and Azu, on east and west shores, respectively, of the bay.

TABLE VI - 22 *Continued*

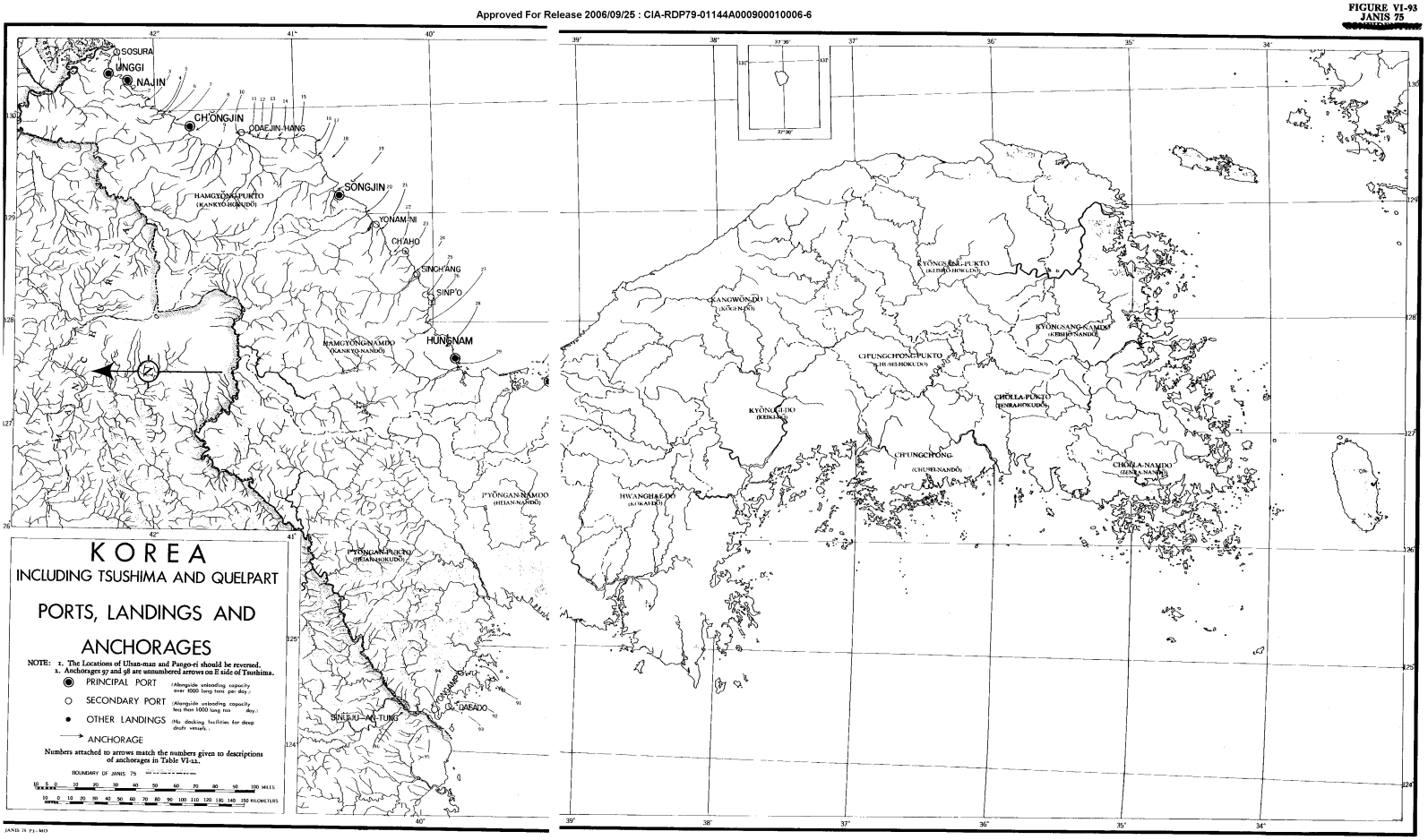
ANCHORAGE

Name and Location	*Approaches* Tides - Currents	Fairway	Holding Ground	Depths in Feet (MLW)	Size	Shelter	*Capacity (No. of Anchorage Berths)* 1st Class	2nd Class	3rd Class	Remarks
109. Izuhara-minato (Izuhara Kō) 34°12'N, 129°18'E. SE coast of Tsushima.	4½' rise.	B	Good	18-55	Small	Fair. Exposed eastward.	....	2	3	Main anchorage is in central portion of bay. More sheltered anchorage for small vessels can be had in north and south arms. Izuhara is principal port of Tsushima, with quays, breakwaters, and small shipyard. Only small vessels can go alongside quays.
110. Agami-wan 34°08'N, 129°17'E.	4½' rise.	B	Good	16-65	Small	Poor. Exposed south and eastward.	....	....	2	Useful only as small vessel haven during W winds.
111. Kuwa-wan 34°07'N, 129°16'E.	4½' rise.	B	Good	10-65	Small	Poor. Exposed south and eastward.	....	....	2	Better protected than Agami-wan, but useful only as small vessel haven during W winds.
112. Naiin-wan 34°06'N, 129°14'E. South coast of Tsushima.	4½' rise. Dangerous cross currents off entrance.	B	Good	16-65	Small	Poor. Completely exposed southward.	....	....	2	Useful only as temporary anchorage for small vessels.
113. Tsutsu-wan 34°06'N, 129°11'E S coast.	No data. Tide rips off entrance to bay.	A	Good	30-130	Medium	Poor. Completely exposed southward.	....	....	2	Untenable during weather from the S.
114. Aso-wan 34°20'N, 129°15'E. W coast.	7¼' rise. Tidal streams 2-4 knots.	A	Fair	30-230	Large	Good.	Unlimited Anchorage.			Shores of Aso-wan are indented by many inlets, in largest of which main anchorages lie. Passages to inner anchorages are tortuous but clear. In SE corner of bay 2 narrow channels available only to small craft lead into Kechi-wan and Miura-wan on E coast. Landing facilities for small craft at various villages throughout the bay.
Principal anchorages in Aso-wan: (a) O-guchi (channel) Central portion of Aso-wan.	7¼' rise. Tidal streams 2-4 knots.	A	Fair	100-250	Large	Fair. Exposed westward.	35	....	.	
(b) Ozaki-wan SW portion of bay.	7½' rise. Tidal streams 2-4 knots.	A	Poor	40-200	Medium	Fair. Exposed northward.	17	....	6	Central portion of bay untenable during weather from N. More sheltered anchorages in Mikata-ura and Kurose Wan, 2 inlets in eastern portion of bay.
(c) Takeshiki-kō Adjoins eastward of Ozaki-wan.	7¼' rise. Tidal streams 2-4 knots.	B	Fair	50-175	Medium	Good.	20	....	....	Former Takeshiki Naval Station on W shore; present facilities unknown.
(d) Nii-ura (Nii Kō) On northern side of bay.	7½' rise. Tidal streams 2-4 knots.	B	Fair	75-150	Small	Good.	6	5	....	
(e) Nobu-wan (Nobu Kō) Adjoins eastward of Nii-ura (Nii Kō).	7½' rise. Tidal streams 2-4 knots.	D	Fair	16-30	Small	Good.	10	6	10	Numerous shoals and islets foul the bay. Entrance very narrow.
115. Tsuna-wan 34°36'N, 129°16'E.	6½' rise.	D	Fair	30-130	Small	Poor. Exposed northward.	....	....	6	Suitable as temporary anchorage only.
116. Minc-wan 34°27'N, 129°17'E.	6½' rise.	B	Good	35-150	Small	Good.	....	....	12	
117. Nita-wan 34°32'N, 129°19'E.	4¼' rise.	B	Good	40-190	Small	Good, although central portion is exposed southwestward.	10		8	Greatest anchorage space is in central portion of bay, N and S of shoal patch, but this space is suitable only as temporary anchorage. More protected anchorage in 2 inlets, Shishimi-kō on S shore, and Nita Uchi, eastward of Shishimi-kō. Shishimi-kō is too restricted for any but small vessels. Several landing places equipped with quays and jetties available for small craft in Shishimi-kō, Nita Uchi, and various coves on NE side of Nita-wan.
118. Sago-wan 34°38'N, 129°20'E. Just Eastward of Sao-saki (Sao Zaki).	4¼' rise.	B	Good	20-45	Small	Good but exposed northward.	....		3	Unsafe during north winds.
119. Sasuna-kō 34°39'N, 129°23'E.	4½' rise.	B	Good	40-65	Small	Good but exposed northwestward.	....	....	4	Town of Sasuna with quays for small craft is located at head of bay.
120. Okawachi-wan 34°41'N, 129°25'E.	4½' rise.	B	Good	36-100	Small	Good.	....	....	6	Bay is constricted by reefs which fringe shores. At head of bay are quays for fishing craft.

TABLE VI - 22 *Continued*

Name and Location	Approaches: Tides - Currents	Approaches: Fairway	Holding Ground	Depths in Feet (MLW)	Anchorage: Size	Anchorage: Shelter	Capacity (No. of Anchorage Berths): 1st Class	2nd Class	3rd Class	Remarks
					C. Cheju-do.					
121. U-do (Gyū-tō) 33°30'N, 126°57'E. Close off NE tip of Cheju-do.	7½ rise. Tidal streams up to 3 knots.	....	Good	40-70	Small	Poor.	....	....	....	Roadstead anchorage between SW tip of U-do (Gyū-tō) and NE tip of Cheju-do.
122. Songsanp'o-hang 33°26'N, 126°56'E. (Jōsanho-kō) E coast.	7½' rise.	A	Good	30-65	Small	Fair. Exposed to SE winds.	4	2	....	Anchorage is in northern half of bay, as southern part is rocky. Fishing station of Songsanp'o-hang (Jōsanho-kō, Josanpo Kō) is on west shore.
123. Sogwi-p'o 33°14'N, 126°36'E. (Seiki-ho) S coast.	8½' rise. Negligible currents.	B	Good	48-96	Small	Fair. Exposed southward.	....	....	....	Inside breakwater at mouth of Yonoe-ch'on (Engai-sen, Koro river) is small craft harbor. Outside harbor is roadstead anchorage for larger vessels. Sogwi-ri is largest settlement on S coast of Cheju-do.
124. Hyongjeio-myoji (Keiteimō-byōchi, Keitei Tō Byochi) 33°13'N, 126°20'E.	8½' rise. Negligible currents.	A	Good	35-80	Small	Fair. Exposed southeastward.	6	....	7	Good temporary anchorage.
125. Piyanglo-myoji (Hiyōtō-byōchi, Hiyō Tō Byochi) 33°24'N, 126°13'E. NW coast.	8½' rise. Tidal streams of about 2½ knots.	....	Good	20-60			....	....	....	Roadstead anchorage between Piyang-do (Hiyū-tō) and NW coast of Cheju. Good anchorage for large vessels with weather from between S and NW. Boat harbor at Hallim-ni (Kanrin-ri) a little over 1 mile NE of Piyang-do (Hiyū-tō).
126. Cheju (Saishi) 33°31'N, 126°32'E.	No data.	....	Poor	30-60		Poor.	....	....	....	Poor roadstead anchorage off town of Cheju, largest on island. Boat basin at the town.
127. Choch'on-ni (Chōsen-ri) 33°32'N, 126°38'E. Close westward of Kan Kan, on N coast.	No data.	....		30-60		Poor.	....	....	....	Roadstead anchorage for large vessels. Boat basin at village.
128. Tal-so (Datsu-shō), (Ta Re, Tatsu Shō) 33°32'N, 126°42'E. About 2½ mi. eastward of Kan Kan.	No data.	....		30		Some shelter from NW winds.	....	....	....	Roadstead anchorage close southeastward of a group of rocks about 600 yards offshore. A 200-ton steamer was able to work cargo here when unable to do so at Cheju or at Choch'on-ni.

FIGURE VI-93
JANIS 75



KOREA
INCLUDING TSUSHIMA AND QUELPART

PORTS, LANDINGS AND ANCHORAGES

NOTE: 1. The Locations of Ulsan-man and Pango-ri should be reversed.
2. Anchorages 97 and 98 are unnumbered arrows on E side of Tsushima.

- PRINCIPAL PORT (Alongside unloading capacity over 1000 long tons per day.)
- SECONDARY PORT (Alongside unloading capacity less than 1000 long tons per day.)
- OTHER LANDINGS (No docking facilities for deep draft vessels.)
- ANCHORAGE

Numbers attached to arrows match the numbers given to descriptions of anchorages in Table VI-22.

BOUNDARY OF JANIS 75

10 0 10 20 30 40 50 60 70 80 90 100 MILES
10 0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 KILOMETERS

JANIS 75 FJ-MO

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